BERNICE
PAUAHI
BISHOP
MUSEUM
OF
POLYNESIAN
ETHNOLOGY
AND
NATURAL
HISTORY

OCCASIONAL
PAPERS
2
1903-07

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOLUME II.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1903–1907.

Bernice Pauahi Bishop Museum
gt.
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BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—NO. 1.

Director's Report for 1902.

HONOLULU, H. I.
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REPORT.

THE year 1902 has been marked in the history of the Museum as one of great disturbance in the arrangement and exhibition of the collections. Not only has Hawaiian Hall been in the hands of the carpenters and polishers, but their operations have extended to nearly every one of the exhibition rooms. The removal of the redwood cases from Hawaiian Vestibule two years ago compelled the storing of a large part of the Hawaiian collection, and even the small representative collection of Hawaiian implements that in temporary cases occupied this room had to yield place while the new koa cases were being set up; so that for the greater part of the year very little of the Hawaiian portion of the Museum has been accessible either to the public or to students. In Polynesian Hall new cases have been built occupying the middle of the floor; and these, although the largest in the room, are already filled. In the Kahili Room the central case has been enlarged and the specimens of Natural History removed to give place to Ethnology.

Each addition to the Museum that its growth has required has been of great advantage both for exhibition and for study, which is another name for work. Polynesian Hall made it possible to separate the general Pacific collection from the Hawaiian, and now Hawaiian Hall gives for the first time an opportunity to properly exhibit and scientifically classify the ethnological material of these Islands and the products of Nature as distinct from those of man's hand. In preparation for this, which I felt sure the wisdom of the founder of the Museum would provide, the Director has given

years of study only to find, as must always be the case, that the limits of his knowledge simply become more defined by the study. Our Hawaiian collection is by far the best in the world, as it should be, but in very many important matters it is still defective. The rapid fading of aboriginal lore from the memory of the present generation, and the rapid passing of the elders of the race, makes it very difficult to add to our knowledge from anything beyond a study of the remains and a comparison with the habits and actions of other neighboring races and of other branches of the Polynesians. It makes painfully evident the gaps in the evidence collected by the Director in his notes nearly forty years ago, and gives rise to vain regrets that the knowledge of what is needed today could not have been his when as a young man he collected all the items he then knew how to gather. The sciences of Ethnology and Anthropology were not then in existence as they are known today, and folklore had not begun to be collected among the backward peoples of the Pacific Ocean.

The ancient customs have been forgotten or so far corrupted as to be of little use save as a record of change, and we must study the implements remaining at least as carefully as the hunter studies the spoor of the game that has preceded him in the path. A large collection of these adds value to the study, and we have here, fortunately, the largest and best in the world. In repeating this I am not unmindful that there are certain private collections on these Islands, and elsewhere, that should be added to this Museum before they are scattered beyond our reach. Already, the past year, a feather cloak of a material not in our collection has passed out of our reach into a more fortunate museum, and I know of no other of this kind accessible. The Hawaiian collections that can be obtained, and that supplement our own, should be at once gathered into this treasure house. Five thousand dollars would enable the Director to add these things. At some future time their loss will be vainly lamented.

In the department of Osteology we are sadly deficient, for we

have not a complete Hawaiian skeleton, and only two, a male adult from Malekula in the New Hebrides, and an Australian male given by Dr. E. C. Stirling, of Adelaide. We should have these of all the Pacific races. Of crania we have a better supply, and Mr. Seale has sent from the southeast Pacific some very interesting specimens. We need more, and also measurements, photographs and physical statistics including casts of hands and feet. Phonographic records of ancient Hawaiian *oli* have been obtained by the kindness of Mrs. P. H. Weaver of the Lunalilo Home, but more are needed. Our casts, made with great care from the entire body of six specimens, some of them of exceptionally good development in these degenerate days, are of a value that cannot be overestimated. I wish we had more of them, for they show what no series of photographic studies can show so well, if at all.

In our collection of Hawaiian arms there are many lacunæ. We need more clubs or newa; more barbed spears; more daggers and ihe pahee. While we have an extensive collection of the large spears (pololu) there are museums in the United States that have more of the smaller spears than we can boast. We need more of the leiomano and larger shark teeth weapons. Our Ethnological collections from other parts of the Pacific have not received important additions, with the exception that from Easter Island and Tahiti we have received a number of very valuable things, the gift of Mr. J. L. Young; and from the Marquesas and neighboring French islands our collector, Mr. Seale, has added many things, as will be seen by the lists appended. While in the eastern States in the Spring the Director was able to get some choice specimens from Mangaia and the Solomon Islands, which had been brought home in the early part of the last century. As Honolulu was built up largely by the whaling industry it seemed desirable to recall to the memory of its present inhabitants the implements of that pursuit, once so familiar here; and by the kindness of Messrs. Wing of New Bedford the Museum was presented with a set of tools exhibited at one of the French Expositions.

The rapidly vanishing native fauna should be saved as far as is now possible by securing such collections as are available; and four thousand dollars can be well spent at once in this way. While we have a collector at work on the land shells, we have not in our cabinets more than half of the described marine shells attributed to our waters. We have about half of the described species of coral, and even a less proportion of the lower marine forms. The Commissioner of Fisheries has informed me that the Commission desire to place in our Museum cotypes of the new species of fish collected by the Albatross expedition last summer, as well as all possible of the general collection made. This generous gift will be of great value in the future study of the Hawaiian fish fauna, which under the wasteful fishing of the Orientals will soon be difficult to find. Our collection of Hawaiian Crustacea is of little importance and should be made an especial object in our future work.

But this report deals more with what we have done and are doing, although all such work is continuous and must be done in reference to future needs. Our Staff has changed its personnel during the year. Mr. Allen M. Walcott, after several years of faithful work, resigned in June to continue his studies in the University of California, and Mr. Leopold Blackman was appointed in his place. Mr. Ralph C. Geer was made assistant to the Director for his great skill in carpentry and general manual work. Mr. C. M. Cooke, Jr., was appointed an assistant as especially interested in studying the distribution and variation of Hawaiian Land Shells, and in this line he has made extensive collections in Nuuanu valley.

Of the older members of the staff Mr. W. A. Bryan has not only, as Curator of Ornithology, cared for the collections in his department, mounting groups of native birds to illustrate their life history, but has also arranged for me the groups of casts of natives at work made several years ago by Allen Hutchinson but not yet placed on public exhibition. The care and skill Mr. Bryan has shown in this work will give pleasure to many visitors in future years, and without the important accessories he has furnished, the

admirable casts would be almost useless for the purpose intended—to illustrate the most important or characteristic employments of old Hawaiians. It may be noted that we had no little difficulty in obtaining models of good types, and also in arranging the pose, so little are the ancient handicrafts practised at the present day. In taxidermy Mr. Bryan's method is the same used with such capital success in South Kensington, New York and other great museums, and it marks the passing of the old method of mounting stuffed birds upon stiff perches without any of their natural surroundings. We may place his work in the front ranks of modern taxidermy.

Mr. J. F. G. Stokes has been my chief assistant now for several years, has acted as Librarian of our small but very choice working library, and he has also kept most of our accounts as well as helped in most of the Museum work. In special work he has constructed a capital model of the ancient heiau of Wahiula in Puna, Hawaii, from surveys and photographs made by him and the Director while camped in the once sacred enclosure. Messrs. Stokes and Walcott, during the early part of the year, went through the entire collection checking specimens by the catalogues and replacing any damaged labels.

Mr. Blackman has, in addition to the various duties of lending a hand in the Museum work, engaged in the preparation and study of some of the principal fibres native to these Islands or grown here, and his results are presented herewith. It is believed that with the awakening interest in the cultivation of fibrous plants, especially sisal, his work in this line will be of considerable interest and value.

Mr. Cooke has been with us but a part of the year, but his collections and study have advanced to that point that I have requested him to prepare an essay on the curious subject of distribution of our Land Shells, and his essay is also submitted.

Mr. Greene has kept the Printing Department at the high level attained in former years, and in addition to the routine work of a Museum Press, including labels, tables, blanks and notices, he has prepared the Annual Report, Memoir No. 4 on Hawaiian Stone

Implements, and No. 5 Supplementary Notes on Hawaiian Feather Work. Some work has been done on the Handbook to the Museum, a work of which the need has long been apparent to those in charge of the Museum, but which could not be issued hitherto owing to the impending rearrangement of the collections. The first volume of Occasional Papers has been issued, and we have also completed the first volume of Memoirs, making a quarto volume of more than four hundred and fifty pages, with sixty-nine plates, two of them in colors, and two hundred and sixty-two figures in the text, both plates and textual illustrations being in general representations of objects in the Museum which have been photographed by the Director and reproduced in half-tone or zincograph by the Sunset Photo-Engraving Company of San Francisco, whose careful and excellent work has added much to the value of the illustrations.

The work of the Museum has not been wholly confined to an attempt to cater for the amusement of the public, which should always be a secondary object with a museum of the character of the Bishop Museum. The collection and diffusion of knowledge and the preservation, for the use of future students, of the evidence collected, that our successors may have better means and greater knowledge for interpreting, should always be first in importance. Situated as we are within the tropics, with a maximum of clear and very actinic sunlight, it is impossible to exhibit constantly many of our greatest treasures, as the feather work, birds, shells and kapas for the fading caused by daily exposure would mean destruction within ten years, and destruction of what can never be replaced. Things that in London could be lighted daily by the comparatively feeble sunlight of that region without much loss of color for years could not bear with the same impunity a month of Honolulu brightness. In illustration of this I may state that labels printed with rubber stamps, using the best "record ink", and type-written matter black enough when made, were quite illegible after three years exposure, not to sunlight but to the diffused light of the galleries.

In collecting Mr. Seale has passed the year in the southeast-

ern Pacific, and has with care and energy explored the high islands of the Marquesan and Tahitian groups, and also the low coral groups of the Paumotus. Many of his collections have arrived safely at the Museum; some of them are already placed in the cases; others, as the fishes, etc., await his return for further study and identification.

During the summer Mr. Bryan had an opportunity offered for the exploration of Marcus Island in the western Pacific, a region particularly interesting to naturalists as the probable meeting place of distinct faunas. By the permission of the Trustees he availed himself of the kindness of the owners of the island, but the Japanese government claiming the little island prevented by armed force any proper exploration, wrongfully, as that government now admits, and the results were not all that we had hoped; still the birds and other material collected prove interesting, and what has been done will be seen by Mr. Bryan's account appended to this report.

Mr. Thompson has continued the fine series of castings of native fish, coloring them with great skill and accuracy. This seems the most successful means of preserving the rapidly evanescent colors of the remarkable inhabitants of our waters, and it is to be hoped that the work may go on until all the fish are as beautifully preserved as those already in the Museum. In all cases the fish, after the casting, are preserved in spirits for dissection or further examination. With the specimens sent by the Fish Commission, these casts and their originals, and the considerable collections of our staff, we may hope to have in the immediate future a fine representation of the fish fauna of these waters. Some of this artist's skill has been given to preserving the fruits of exceptional interest, and now visitors at any season can see good specimens of the tropical fruits grown here, a matter of no little interest to intending settlers.

The mention of these fruits calls to mind another attempt that the Museum has been making to illustrate the vegetable and mineral products of this group. All accessible fibres have been

prepared by Mr. Blackman, and their strength tested; specimens of coffee, arrowroot, cocoa, vanilla, rice, have been purchased, or in a few rare cases given, and it is hoped that an interesting, if not wholly satisfactory, exhibition of Hawaiian commercial products may be offered to visitors by the time the new hall is ready for the public.

The number of visitors has been nearly as large as last year, although the storm in November rendered the attendance for that month less than usual. The number of Chinese has greatly increased, and the Japanese also outnumber the Hawaiians. The list given may be of interest to compare with former years.

TABLE OF ATTENDANCE.

1902.	Whites.	Hawaiians.	Portuguese.	Chinese.	Japanese.	Others.	Open on: Public days.	Open on: Other days.	Visitors on closed days.	Average Attendance: Public days.	Average Attendance: Other days.	Total Visitors.
January	400	131	48	110	104	2	9	3	42	84	17	795
February	355	64	30	309	115	2	8	4	17	107	4	875
March	435	146	8	90	53	3	9	3	5	81	1.6	735
April	454	55	12	175	83	1	8	10	78	88	8	780
May	366	109	60	230	98	3	10	4	50	81.6	12.5	866
June	348	57	29	107	70	....	8	6	28	73	4.6	611
July	286	42	13	138	159	....	8	9	41	75	4.6	638
August	322	60	82	147	124	1	10	3	11	72.5	3.6	736
September	244	109	33	110	126	....	8	6	29	74	5	622
October	352	157	59	167	128	....	9	4	47	91	12	863
November	241	79	8	87	51	1	9	4	31	48.5	8	467
December	243	136	16	96	57	....	8	3	8	67.5	3	548
Totals	4046	1145	398	1766	1168	13	104	59	377	78.5	6.6	8536

The Museum has sustained no damage from visitors, thanks to the vigilance of the attendants, but observation leads to the belief that the lawless element in the community is increasing, and if the public is to be admitted as freely as in the past more precautions must be taken to guard the collections; hence all specimens that can be so disposed of have been placed in cases.

The additions to the library have been almost entirely by exchange of our publications and by gift. Few books have been purchased. A list of accessions is appended. The lists of accessions in other departments will show some notable additions, among which may be mentioned a skeleton of *Mesoplodon Hectori* from

New Zealand. It must be confessed that the increase in the collections the past year has not been wholly satisfactory, and it is hoped that with the enlarged facilities for storage and exhibition another year may show an improvement. It is, however, a matter of congratulation that we have not been compelled to accept unsuitable specimens, or undesirable collections. May we continue to be small and select rather than large and miscellaneous.

List of Accessions.

DEPARTMENT OF ETHNOLOGY.

Collection given by Mrs. M. D. Hendricks.

5800 Grass belt. New Hebrides.
5801 Mask. Santa Cruz Ids.
5802 Basket. Santa Cruz Ids.
5803 Hat. Santa Cruz Ids.
5804 Dancing rattles. Santa Cruz Ids.
5805 Small shell rattles. Santa Cruz Ids.
5806 Head ornament of shell. New Hebrides.
5807 Lime box of human bone. New Hebrides.
5808 Wooden ornament. Solomon Ids.
5809 Mortar and pestle for betel nut. Solomon Ids.
5810 Nose pin. Solomon Ids.
5811 Totoisha. Solomon Ids.
5812 Necklace of dog teeth. Gilbert Ids.
5813 Shark hook.
5814 Shield. New Guinea.
5815 Head band. Micronesia.
5816 Fish hook. New Zealand.
5817 Heitiki of bone. New Zealand.
5818 Patu of wood. New Zealand.
5819 Flaxen kit. New Zealand.
5820 Squid sinker. Society Ids.

5821-2 Fishing lines and hooks. Samoa.
5823 Paddle. Fiji.
5824 Coconut spoons, carved. New Guinea.
5825 Fans (4). Samoa.
5826-7 Boomerangs. Australia.
5828 Stone axe.
5829 Basket. South Australia.
5830-1 Spears. Australia.
5832-4 Clubs. Australia.
5835 Small models of Australian weapons — 2 shields, 4 clubs and 2 boomerangs.
5836-7 Dancing skirts. Samoa.
5838 Spear thrower. Australia.
5839-40 Totem poles. Alaska.
5841 Necklace of porpoise teeth. Hawaiian Ids.
5842 String of whale teeth. Hawaiian Ids.
5843 Rotary drill. American Indian.
5844 Skirt of fibre. American Indian.
5845 Skirt of Pandanus. Samoa.
5846-7 Tapa. Samoa.
5848 Collection from the North American and Alaskan Indians, comprising:—Model of oomiak; hide scraper; horn, bone and wooden spoons, and bone fork; dancing rattles, time beaters, tambourine, drum sticks, necklaces, basketwork plates, water bottles, shark hook, adze, beaded medicine bags, moccasins, horses' girths, bridles, loom for weaving blanket, Chinese ivory ball finely carved.

Given by J. L. Young, Esq.

5942 Wooden image of sea eel. Rapanui.
5943 Wooden lizard figure. Rapanui.
5944-5 Wooden clubs. Rapanui.
5946 Wooden image of chiton. Rapanui.
5947-8*b* Wooden balls used at dances. Rapanui.
5949-50 Wooden male figures of the long-eared race. Rapanui.
5951 Wooden male figure of the short-eared race. Rapanui.
5952-3 Wooden female figures of the long-eared race. Rapanui.
5954-6 Pieces of fetish wood. Rapanui.
5957 Piece of shell fetish. Rapanui.

5960 Broken pieces of stone medicine bowls. Rapanui.
5961 Stone knife. Rapanui.
5962-7 Obsidian spear heads. Rapanui.
5968 Quantity of chippings from tools, mainly of obsidian. Rapanui.
5969 Ceremonial head fillet. Rapanui.
5970-2 Ceremonial hat. Rapanui.
5973 Wooden seat. Anaa, Paumotu Arch.
5974 Shark hooks. Napuka, Paumotu Arch.
5975-6 Shark hooks. Akahaina, Paumotu Arch.
5980 Wooden mallet. Mangareva.
5981 Stone ball. Mangareva.
5983 Stone adze head. Pitcairn.
5984 Stone adze head. Oeno.
5985 Stone adze head. Rapa.
5986 Stone adze head. Caroline, near Society Ids.
5987 Wooden breadfruit knife. Omoa, Marquesas Ids.
5988 Wooden food bowl. Omoa, Marquesas Ids.
5989 Wooden food bowl. Hivaoa, Marquesas Ids.
5990 Tapa beater. Papara dist., Tahiti.
5991 Tapa beater. Raiatea.
5992 Tapa beater. Rurutu.
5993 Tapa beater. Vavitao.
5994 Stone adze head. Papenoo, Tahiti.
5995 Stone adze head. Papara, Tahiti.
5996 Stone adze head. Huahine.
5997-8 Wooden medicine dish. Tahiti.
5999 Tairitu, small water-worn pebble of historical fame. Atiu, Hervey Ids.
6000 Awa bowl. Savaii, Samoa.

Miscellaneous Gifts.

5869 War club. Samoa. Given by Mrs. Grace Chapman.
5915-16 Collection of 9 paleolithic and 21 eolithic implements from England. Given by R. D. Darbishire, Esq.
5932 Harpoon. New Bedford. Given by Messrs. J. and W. R. Wing.
5933 Whaling lance. New Bedford. Given by Messrs. J. and W. R. Wing.

5934 Blubber spade. New Bedford. Given by Messrs. J. and W. R. Wing.

5936 Large grindstone. Kauai, H. I. Given by G. R. Ewart, Esq.

5937 Jacket lamp. New Bedford. Given by Messrs. J. and W. R. Wing.

6002 Male skeleton. Hillston, South Australia. Given by Dr. E. C. Stirling.

6020 Cast of Hawaiian kapa beater. Given by the Smithsonian Institution.

6034 Paddle. Mangareva. Given by Chief Typeroa.

6093 Tapa. Rurutu. Given by Orsmond Walker, Esq.

6111 Coconut cup. Hivaoa. Given by Rev. Kauwealoha.

6202 Large shrimp basket. Hawaiian Ids. Given by R. C. Geer.

6203 Pacific cable, section of land end. Given by T. M. Rae.

Loaned.

6019 Implement of basalt, found at Moanalua, Oahu. Loaned by S. M. Damon, Esq., while a cast was made.

6215 Hawaiian collection, loaned by Mrs. A. F. Judd, comprising: 1 feather cape and lei, 20 umeke, 1 finger bowl, 2 fish dishes, 2 lei palaoa.

6216 Picture of the late C. M. Hyde, D.D. Loaned by Mrs. Hyde.

6217 Picture of Kamamalu. Loaned by Mrs. Helen Wilder Craft.

6219 Hawaiian collection and pictures, loaned by Mrs. E. Kekaaniau Pratt, comprising: 2 pictures, 6 feather lei, 15 kahili, 5 kahili handles, 13 umeke, 5 coconut bowls, and 1 Niihau mat.

Collected.

6021-30 Adze heads. Rapa.

6031-2 Adze heads. Mangareva.

6035-8 Adze heads. Austral Ids.

6039 Axe head. Austral Ids.

6070 Stone implement. Austral Ids.

6071 Stone knife (?). Austral Ids.

6072-6 Stones. Austral Ids.

6077 Stone implement. Austral Ids.

6079-82 Poi pounders. Austral Ids.

6083-6 Mounted adzes. Austral Ids.

6087-8 Tapa beaters. Austral Ids.
6079 Pearl fish hook. Austral Ids.
6090 Coconut cup. Austral Ids.
6091-2 Tapa. Austral Ids.
6094 Basket. Paumotu Arch.
6095 Fragment of wood. Paumotu Arch.
6096 Stick. Paumotu Arch.
6097 Wooden pestle. Paumotu Arch.
6098 Wooden dish. Paumotu Arch.
6099 Coconut water bottle. Paumotu Arch.
6100 Cap of tapa and fibre. Paumotu Arch.
6101 Sennit. Paumotu Arch.
6103 Bambu for hat making. Society Ids.
6104 Paddle. Hervey Ids.
6105-7 Paddles. Marquesas Ids.
6108 Canoe bailer. Marquesas Ids.
6109 War trumpet. Marquesas Ids.
6110 Ornament. Marquesas Ids.
6112-18 Tapa. Marquesas Ids.
6119-20 Mats. Marquesas Ids.
6121-2 Fringed cinctures. Marquesas Ids.
6123 Tapa jacket. Marquesas Ids.
6124 Human hair necklace. Marquesas Ids.
6125 Human hair armlet. Marquesas Ids.
6126 Cord. Marquesas Ids.
6127 Feather head dress. Marquesas Ids.
6128 Tapa beater. Marquesas Ids.
6129 Fire sticks. Marquesas Ids.
6130 Stilt rest. Marquesas Ids.
6131 Coconut cup. Marquesas Ids.
6132 Coconut, carved. Marquesas Ids.
6133 Boar tusk. Marquesas Ids.
6134 Bone piercers. Marquesas Ids.
6135 Carved tobacco pipe. Marquesas Ids.
6136 Shell ornament. Marquesas Ids.
6137 Coral polisher. Marquesas Ids.
6138 Stone axe head. Marquesas Ids.
6139 Adze. Marquesas Ids.
6140-7 Stone adze heads. Marquesas Ids.

6148 Poi pounder. Marquesas Ids.
6149-54 Wooden bowls. Marquesas Ids.
6155 Wooden dish. Marquesas Ids.
6156 Wooden seat. Marquesas Ids.
6157 Wooden drum. Marquesas Ids.
6158 Wooden awa dish. Marquesas Ids.
6159 Wooden box with cover. Marquesas Ids.
6160 Wooden dish. (?)
6161-5 Fish hooks. Marquesas Ids.
6166 Necklace of teeth. Marquesas Ids.
6167 Tapa. Marquesas Ids.
6168 Bundle of bark and tapa partly made. Marquesas Ids.
6169-72 Stones. (?)
6173 Tapa beater. (?)
6174 Rasp. (?)
6175-6 Wooden images. (?)
6177 Sandals. (?)
6180 Stone pestle. (?)
6181 Stone. (?)
6182 Piece of wood. (?)
6184 Bundle of tapa. Marquesas Ids.
6185 Human skull and jawbone. Mangareva.
6186-91 Human skulls. Mangareva.
6192 Human jaw bone. Mangareva.
6193 Inscribed stone. Austral Ids.
6194-5 Idols. Society Ids.

Purchased.

1938 Grass skirt. British New Guinea.
1939 Palm-leaf skirt. British New Guinea.
1940 Comb. British New Guinea.
3212-13 Salt pans of stone. Hawaiian Ids.
5849-50 Koa canes from the Hale Naua. Hawaiian Ids.
5851 Man's outfit for the Hale Naua. Hawaiian Ids.
5852 Woman's outfit for the Hale Naua. Hawaiian Ids.
5853 Stone gouge, used in the Hale Naua. Hawaiian Ids.
5854 Bonnet, used in the Hale Naua. Hawaiian Ids.
5855-7 Aprons, used in the Hale Naua. Hawaiian Ids.
5858 Malo, used in the Hale Naua. Hawaiian Ids.
5859-60 Tippets of yellow cloth, used in the Hale Naua. H. I.

5861-2 Kapa, used in the Hale Naua. Hawaiian Ids.
5863-5 Niihau mats, used in the Hale Naua. Hawaiian Ids.
5866-7 Silk flags, used in the Hale Naua. Hawaiian Ids.
5868 Pair of silver tassels, used in the Hale Naua. Hawaiian Ids.
5870 War club. Samoa.
5881 Stone axe. British New Guinea.
5882 Ceremonial adze. New Caledonia.
5883-4 Stone mortars. Hawaiian Ids.
5885 Stone dish. Hawaiian Ids.
5886 Salt pan of stone. Hawaiian Ids.
5887-8 Poi pounders. Hawaiian Ids.
5889-92 Stone pestles. Hawaiian Ids.
5893-5908 Stone adzes. Hawaiian Ids.
5909 Stone hammer. Hawaiian Ids.
5910 Ulumaika. Hawaiian Ids.
5911-12 Polishing stones. Hawaiian Ids.
5913 Stone sinker. Hawaiian Ids.
5914 Sinker of coral rock. Hawaiian Ids.
5918 Paddle. Marquesas Ids.
5919 Club. Samoa.
5920 Tinder box, containing flints and steel. New Bedford, Mass.
5928 Club. Fiji.
5929 Club. (?)
5930 Paddle. (?)
5931 Spear. Solomon Ids.
5935 Harpoon bomb-gun. New Bedford, Mass.
5938 Eskimo blubber knife of bone.
5939 Ceremonial adze. Hervey Ids.
6003-4 Umeke, Lahaina pattern. Maui, H. I.
6005 Stone lamp. Hawaiian Ids.
6006 Poi pounder. Hawaiian Ids.
6007-10 Stone adzes. Hawaiian Ids.
6011 Ulumaika. Hawaiian Ids.
6012 Squid hook. Hawaiian Ids.
6013-17 Fish hooks. Hawaiian Ids.
6018 Stone offertorium. Hawaiian Ids.

DEPARTMENT OF ORNITHOLOGY AND MAMMALOGY.

Collected except where otherwise mentioned.

5978 Jaw of cetacean. Nengonengo, Paumotu Arch. Given by Mr. J. L. Young.

9000-2 and 9005 Four pairs goat horns. Hawaii. Given by Mr. S. E. Damon.

9003 Mystacina tuberculata. New Zealand. Purchased.

9004 Mesoplodon hectori (skeleton). New Zealand. Purchased.

9006 Sus papuensis. New Guinea. Purchased.

9007 Model of head of right whale. Purchased.

Skins (147) from Marquesas and Austral Ids., Makatea and Mangareva. Not yet catalogued.

2001-2 Nycticorax nycticorax nævius (Bodd.), ♀, nest and five eggs. Oahu.

2003 Nycticorax nycticorax nævius (Bodd.), juv. Oahu. Given by Mr. A. C. True.

2004 Buteo solitarius Peale. Hawaii. Given by Mr. S. E. Damon.

2005 Corvus hawaiiensis Peale. Hawaii. Given by Mr. S. E. Damon.

2006 Gymnorhina tibicen, ♀. New South Wales. Given by Wm. T. Brigham.

2007-9 Asio accipitrinus sandvicensis (Blox.), 3 juv. Oahu. Given by Dr. G. H. Huddy.

2010 Asio accipitrinus sandvicensis (Blox.), nest. Oahu.

2011 Asio accipitrinus sandvicensis (Blox.) ♂. Oahu. Given by Mr. Oliver Lansing.

2012-14 Nycticorax nycticorax nævius (Bodd.), 1 ♀ and 2 nests. Oahu.

2019 Casarca tadornoides Eyton. New South Wales. Purchased.

2020 Eurynorhynchus pygmæus (Linn.). Wichicken. Purchased mounted.

2021 Aptenodytes patagonica Bonnat. Kerguelen Id. Purchased mounted.

2022 Sterna paradisæa Brün. Oahu. Purchased.

2029 Circinarus regius Linn. New Guinea. Purchased.

2030-1 Rhytidoceros plicatus (Forst.), 2 ♂. New Guinea. Purchased.

2032 Scythrops novæ-hollandiæ Lath. ♀ New Guinea. Purchased.

2033 Goura albertisii Salvad. ♂ New Guinea. Purchased.

2034-5 Eurystomus crassirostris Scl., 1 ♂, 1 ? New Guinea. Purchased.

2036-7 Eos fuscata Blyth, ♂ & ♀. New Guinea. Purchased.

2038 and 2041 Lorius erythrothorax Salvad., ♀ & ♂. New Guinea. Purchased.

2039-40 Trichoglossus massena Bp., ♂ & ♀. New Guinea. Purchased.

2042-5 Eclectus pectoralis (Müll.), 2 ♂, 2 ♀. New Guinea. Purchased.

2046-7 Cracticus cassicus (Bodd.), ♂ & ♀. New Guinea. Purchased.

2048 Todopsis cyanocephala (Q. & G.), ♂. New Guinea. Purchased.

2049-50 Arses telescopthalmus (Garnot), 2 ♂. New Guinea. Purchased.

2051-3 Munia caniceps Salvad., 3 ♂. New Guinea. Purchased.

2054-5 Calornis metallica (Temm.), ♂ & ♀. New Guinea. Purchased.

2056 Seleucides niger (Shaw), ♀. New Guinea. Purchased.

2057 Paradisea apoda Linn., ♂. New Guinea. Purchased.

2058 Dacelo intermedia Salvad., ♂. New Guinea. Purchased.

2059-60 Syma torotoro Less., 2 ♀. New Guinea. Purchased.

2061-2 Circus sp., ♂ & ♀. New Guinea. Purchased.

2063 Turtur chinensis (Scop.), ♂. Oahu. Given by Wm. T. Brigham.

2064-6 Nycticorax nycticorax nævius (Bodd.), 1 ♂, 2 ♀. Oahu.

2067 Anas wyvilliana Scl., ♂. Oahu. Given by Mr. G. P. Wilder.

2068 Phasianus torquatus × versicolor, hybrid, ♀. Oahu. Given by Mr. J. W. Harvey.

2069 Larus vegæ Stejn. Marcus Id.

2070 Diomedea immutabilis Roths. Marcus Id.

2071-4 Phaëthon rubricauda Bodd., 3 ♂, 1 ♀. Marcus Id.

2075 Sula piscator (Linn.). Marcus Id.

2076-9 Sula sula Linn., ♂, ♀, and 2 juv. Marcus Id.

2080-1 Anous stolidus (Linn.), 2 ♀. Marcus Id.

2082-8 Sterna fuliginosa Gmel., ♂ and 6 juv. Marcus Id.
2089-91 Microanous sp., ♂, juv., and 1 ? Marcus Id.
2092-5 Gygis alba kittlitzi Hart., 2 ♂, 1 ♀, 1 juv. Marcus Id.
2096-99 Fregata aquila Linn., juv. Marcus Id.
2100 Heteractitis incanus (Gmel.). Marcus Id.
2101 Charadrius dominicus fulvus (Gmel.). Marcus Id.
2102-8 Puffinus nativitatis Streets, ♂, ♀, 4 juv., 1 ? Marcus Id.
2109-16 Priofinus cuneatus (Salvin), 5 ♂, 2 ♀, 1 juv.
2117-32 Sterna fuliginosa Gmel., 1 ♂, 8 ♀, 5 juv., 2 ? Midway Id.
2133-46 Microanous sp., 3 ♂, 9 ♀, 2 ? Midway Id.
2147-51 Anous stolidus (Linn.), 1 ♀, 4 juv. Midway Id.
2152-4 Gygis alba kittlitzi Hart., ♂, ♀, juv. Midway Id.
2155-8 Arenaria interpres (Linn.), ♂, 2 ♀, 1 ? Midway Id.
2159-70 Limosa lapponica baueri (Naum.), 6 ♂, 5 ♀, 1 ? Midway Id.
2171-5 Phaëthon rubricauda Bodd., ♂ and 3 juv. Midway Id.
2176-80 Priofinus cuneatus (Salvin), 2 ♂, 3 juv. Midway Id.
2181 Porzanula palmeri Froh., ♂. Midway Id.
2182-3 Sula piscator (Linn.), juv. and ? Midway Id.
2184-9 and 2191 Fregata aquila Linn., 2 ♂, 2 ♀, 3 ? Midway Id.
2190 Arenaria interpres (Linn.), ♂. Midway Id.
2192-8 Bodies in alcohol. Midway Id.

VARIOUS DEPARTMENTS.—ICHTHYOLOGY.

5878 Cast of shark. Pacific Ocean.
5879 Dried head of ———. Hereheretue, Paumotu Arch. Given by Mr. J. L. Young.
6197 Collection of fishes from the Southeast Pacific, made by Alvin Seale, and now awaiting his identification.
6201 Cephalacanthus sp. Hilo, Hawaii. Given by Prof. H. W. Henshaw.
9006 Fishes (160) collected on Marcus Id. by Mr. Bryan, and awaiting Mr. Seale's identification.

BOTANICAL.

6001 Kauri gum, two specimens. New Caledonia. Given by Mr. J. L. Young.

6102 Coconut with two horns. Paumotu Arch. Given by Mr. Jas. Gibson.

6199 Plants collected by Mr. Seale.

9007 Plants (28) collected by Mr. Bryan on Marcus Id.

9008 Plants (51) collected by Mr. Bryan on Midway Id.

GEOLOGICAL.

5958 Scoria. Rapanui. Given by Mr. J. L. Young.

5959 Obsidian. Rapanui. Given by Mr. J. L. Young.

6033 Specimens (6). Mangareva. Collected by Mr. Seale.

6078 Specimens (7). Austral Ids. Collected by Mr. Seale.

6178 Specimens. (?) Collected by Mr. Seale.

6179 Coral rock. (?) Collected by Mr. Seale.

6183 Coral rock. (?) Collected by Mr. Seale.

MOLLUSCA.

5921 Collection of shells from Fanning and Washington Ids. Given by Mr. W. H. C. Greig.

Collection of shells purchased.

6198 Collection made by Mr. Seale in Southwest Pacific.

6205 Achatinella thaanumi Bald., Puna, Hawaii. Given by Mr. Mr. F. W. Thrum.

9009 Specimens (460) collected by Mr. Bryan on Marcus Id.

MISCELLANEOUS.

5923 Sponges from Liu Kiu, 10 specimens.

5924 Sponges from Liu Kiu, 2 specimens.

5925 Sponges from Liu Kiu, 3 specimens.

5926 Sponges from Liu Kiu, 2 specimens.

5927 Sponges from Liu Kiu, 1 specimen.

5977 Coral (Astraea sp.) growing round mikimiki wood; 2 specimens. Reao, Paumotu Arch. Given by Mr. J. L. Young.

5982 Skull of turtle. Mangareva. Given by Mr. J. L. Young.

9005 Land reptiles collected by Mr. Bryan on Marcus Id.

LIST OF ADDITIONS TO THE LIBRARY

Those received by exchange are denoted by an asterisk.

*Academy of Natural Sciences of Philadelphia.—Proceedings, vol. liii, part 3; vol. liv, part 1.

American Anthropologist, vol. iv, no. 1.

*American Museum of Natural History.—Bulletins, vol. xi, part 4; vol. xiv; vol. xv, part 1; vol. xvii, part 1; vol. xviii, part 1.—Memoirs, vol. iii, no. 1; vol. vi.—Annual report for 1901.

American Numismatic and Archæological Society. — American Journal of Numismatics, vols. i-xiv.—Catalogue of numismatic books in library, 1883.—Catalogue of medallic portrait gallery, 1891. Given by a friend.

*American Philosophical Society.—Proceedings, vol. xl, no. 167; vol. xli, nos. 168-70.—Transactions, vol. 20, part 3.

Anatomy and Physiology, The Journal of. Vol. xvi, parts 2 and 4.

*Anthropological Institute of Great Britain and Ireland.—Journal, new series, vol. iii, 1900; vol. xxxi, 1901; vol. xxxii, January-June, 1902.—Occasional Papers, no. 1.

*Anthropologie de Paris, Revue de l'École d'. Decembre, 1901–Novembre, 1902.—Table decennale (1891-1900).

*Anthropologie de Paris, Société d'.—Bulletins et mémoirs Ve serie, tome ii, fasc. 4-6; tome iii, fasc. 1 et 2.—La Société en 1901.

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*Asiatic Society of Bengal.—Proceedings 1901, 9-11; 1902, 1-5.—Journal, vol. lxx, part 2, no. 2; part 3, no. 2; vol. lxxi, part 2, no. 1; part 3, no. 1.

Atkinson, Geo. T.—Mushrooms, edible, poisonous, etc. Ithaca, 1901.

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Ball, R. S.—The Earth's Beginning. New York, 1902.

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against Hon. A. S. Humphreys. Honolulu, 1901.—Report of the Attorney-General. Washington, 1901. Given by A. F. Judd, Esq.

Beddard, F. E.—Mammalia. London, 1902.

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Blackman, Leopold.—Kaupeepee; An Idyll of Hawaii. Given by the author.

*Boston Public Library.—Annual list of new books, 1900-1.—Fiftieth annual report, 1901-2.—Monthly Bulletins.

*Boston Society of Natural History.—Proceedings, vol. xxix, nos. 15-18; vol. xxx, nos. 1 and 2.

British Museum.—Culicidae, by F. W. Theobald, in 2 vols.—Catalogue of birds' eggs, vol. ii.—Handbook of instructions for collectors.

Britton, Nat. L., and Brown, Addison.—An illustrated flora of the Northern United States and Canada, in 3 vols. New York, 1896-8.

Brooklyn Institute of Arts and Sciences.—Thirteenth year book, 1900-1. Given by Messrs. Brackett and Woodward.

*California Academy of Sciences.—Proceedings: botany, vol. ii, nos. 6-10; zoology, vol. iii, nos. 2-4.

*Carnegie Museum (Pittsburg).—Publications, nos. 8-10 and 12. Memoirs, vol. i, no. 1.

Census Reports.—Twelfth census of the United States, vol. viii, parts 2 and 3; vol. x, part 4. Given by Hon. S. M. Damon.

Century Dictionary and Cyclopedia of Names. New York.

Chapman, Frank M.—Bird studies with a camera. New York, 1900.—Handbook of birds of Eastern North America. New York, 1901.

Chapman, Frederick.—The foraminifera. London, 1902.

Cincinnati Museum Association.—Twenty-first annual report, 1901.—Ninth annual exhibition of American art, 1902.

Colquhoun, A. R.—The mastery of the Pacific. New York, 1902.

Currency.—Annual report of the Comptroller of Currency, 1901, 2 vols. Given by Hon. S. M. Damon.

Cushing, Frank H.—Zuñi folk tales. New York, 1901.

Documents (Given by the Superintendent of Documents):—

Proceedings of the fifteenth meeting of the Convention of American Instructors of the Deaf, 1898.

Digest of opinions of attorneys-general on international law. 1877.

Catalogue of public documents of the 53rd and 54th Congress, 1st and 2nd sessions.

Documentary index, 54th–56th Congress.

Hearings on interoceanic canals, 1st session 57th Congress, part 1.

Report on interoceanic canals, 1st session 57th Congress.

Annual reports of the commissioner of labor, nos. 22, 23, 25, 30, 31, 33.

Bulletins of the Library of Congress, copyright office, no. 1, and no. 4, parts 2 and 3.

Report of the Librarian of Congress for the year ending June 30, 1898.

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*Field Columbian Museum.—Publications: geological series, vol. 1, nos. 9-11; zoological series, vol. iii, no. 6; report series, vol. ii, no. 1; anthropological series, vol. iii, no. 2.

*Free Museum of Science and Art.—Bulletin, vol. iii, no. 4.

Gardiner, J. Stanley.—The fauna and geography of the Maldive and Laccadive Archipelagoes, vol. i, parts 2 and 3.

Gentry, Thomas G.—Intelligence in plants and animals. New York, 1900.

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*Harvard University Library.—Fourth annual report, 1901.

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Hooker, J. D.—Handbook of New Zealand flora. London, 1867.

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*Indian Museum.—Annual report, 1900-1.—Account of Indian triaxonia collected by "Investigator", by Franz Eilhard Schulz. 1902.

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*Italiana d'Antropologia, Società.—Archivio per l'antropologia e l'etnologia, vol. xxviii-xxxi, e vol. xxxii, fasc. 1 e 2.

*K. K. Naturhistorischen Hofmuseums, Annalen des. Band xv, Nr. 3 und 4; Band xvi. Wien, 1900-1.

*Kongl. Vitterhets Historie och Antiqvitets Akademien.—Månadsblad, 1872-89, 1891-6, 1900.—Antiqvarisk Tidskrift för Sverige, del. ii-viii, ix 1-3, x, xi 1-5, xii, xiii 1-3, xiv 1-3, xv 1 och 2 xxi.—Techningar ur Svenska Statens Historiska Museum: Andra häftet, serien VI, plancherna i-x, 1878; Tredje häftet, serien V, plancherna i-v, 1883.—Catalogue Sommaire par Oscar Montelius.—Congrés International d'Anthropologie et d'Ethnologie Préhistoriques: Compte rendu de la 7e session, Stockholm, 1874.

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*Königliche Museum für Völkerkunde in Berlin.—Ethnographisches Notizblatt, Band iii, Heft 2.

Kroeber, A. L.—Ute tales. Given by the author.

*Leland Stanford Jr. University.—Contributions to biology, xxvii-xxix.

"Leonidas".—Log book of the whaling ship "Leonidas", of New Bedford, from August 19th, 1851, to June 9th 1854. Given by Mr. A. H. Covell.

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*Linnean Society of New South Wales.—Proceedings, vol. xxvi, parts 3 and 4; vol. xxvii, parts 1 and 2.

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*Maryland Geological Survey.—Vol. iv. Baltimore, 1902.

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Matthews, F. Schuyler.—Familiar flowers of field and garden. New York, 1901.

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*Museo Paraense de Historia Naturale e Ethnographia.—(Museu Goeldi) Boletim, vol. iii, no. 2.—Memorias I and II.—Aboretum Amazonicum, 1ª e 2ª decada.—Album de Aves Amazonicas; 1º fasciculo, estampas 1-12.

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*Museum of Fine Arts.—Twenty-sixth annual report. Boston, 1902.

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Newton, Alfred, and Gadow, Hans.—A dictionary of birds. London, 1893-6.

*New York Botanical Garden.—Bulletin, vol. ii, no. 7.

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*Oberlin College.—Bulletins 11 and 12.—The Wilson Bulletin, vol. ix, no. 3.

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*Peabody Museum of American Archæology and Ethnology.—Codex Nuttall.—Memoirs, vol. i, no. 6.—Thirty-fifth report, 1900-1.

Pepper, Geo. H.—Making of a Navajo blanket.—Ancient basket makers of Southeast Utah. New York, 1902. Given by the author.

Perkins, R. C. L.—Notes on Hawaiian aculeate hymenoptera.—An introduction to the study of the drepanidæ.—Four new species and a new genus of parasitic hymenoptera.—On the generic characters of Hawaiian crabronidæ. Given by the author.

Petermann, A.—Mittheilungen, 47 Band xi und xii, 48 Band i-vi, viii-x.

*Polynesian Society.—Journal, vol. x, no. 4; vol. xi, nos. 1-3.

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*Real Academia de Ciencias y Artes de Barcelona.—Memorias, tercera época, vol. iv no. 1-19.—Boletin, tercera época, ano 1901, vol. ii, no. 1-3.—Nomina del Personal Académico.

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*Rijks Ethnographisch Museum te Leiden.—Verslag van den Directeur over het tijdvak van 1 Oct. 1900 tot 30 Sept. 1901.

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*Royal Society of Queensland.—Proceedings, vol. xvii, part 1.

*Royal Society of South Australia.—Transactions and proceedings, vol. xxv, part 2.

*Royal Society af Victoria.—Proceedings, vol. xiv, part 2; vol. xv, part 1.—Transactions, vols. i-iii, part 1; vol. iv.

Scheider, Albert.—Guide to the study of lichens. Boston, 1898.

Schück, A.—Die Stabtkarten der Marshall-Insulaner. Hamburg, 1902.—Magnetische Beobachtungen an der Deutschen Ostseeküste, Iia. Hamburg, 1902. Given by the author.

*Smithsonian Institution.—Bureau of Ethnology, eighteenth annual report, part 2; nineteenth annual report.—Bulletin, 26.

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Thrum, Thos. G.—The Hawaiian annual. Honolulu, 1897, 1898, 1901, 1902. Given by Thos. G. Thrum, Esq.

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U. S. Geological Survey.—Twenty-first annual report.—Monographs, xl and xli.—Bulletins, nos. 177-90, 192-4.—Geological and mineral resources of Copper River District, Alaska. 1901. —Reconnaisances in the Cape Nome and Norton Bay Regions, Alaska. 1901. Given by the Department.

*U. S. National Museum.—Report of department of biology, 1899-1900.

*Universiteit van Amsterdam.—Boeken en Brochures over de Roomsch-Katholicke Kerk in 't Algemeen en de Ordre der Jesuieten in 't Bijzonder. Amsterdam, 1901.

*University of California.—Annual reports for the years ending June 30, 1900 and 1901.—The University Chronicle, vol. iv complete; vol. iv, 5 and 6; vol. v, 1-3.—Bulletins, new series, vol. ii, no. 4; vol. iii, no. 1.—Agricultural experiment station, bulletins, 131-9.—Nature study bulletins.—Library bulletin, no. 1.

*University of Kansas.—Bulletins, vol. ii, no. 7; vol. iii, no. 6; —Science bulletin, vol. i, nos. 1-4.

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*University of Pennsylvania.—Catalogue, 1901-2.—Bulletins, second series, no. 1, part 2; no. 2, part 4; no. 4, part 2. —Contributions from the zoological laboratory, 1901.—Jefferson, Alice M.: Aromatic bases as precipitants for rare earth metals. 1902.—Colvin, Caroline: Invasion of Ireland by Edward Bruce. 1902.—Shimmel, L. S.: Border warfare in Pennsylvania. 1901.—Yocum, A. D.: Inquiry into the teaching of addition and subtraction. 1901.—Harris, H. J.: Handworking and domestic industries of Germany. 1902. —Turner, A. B.: Secular perturbations arising from the action of Jupiter on Mars. 1902—Wyman, L. P.: Purification of tungstic acid. 1902.—Kammerer, A. L.: Electrolytic estimation of bismuth and its separation from other metals. 1902.—Rogers, Allen: Derivatives of new complex inorganic acids. 1902.

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*Yale University.—Report of the librarian. 1900-1.
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LIST OF EXCHANGES.

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American Museum of Natural History. New York.
American Philosophical Society. Philadelphia.
Amherst College Library. Amherst, Mass.
Anthropological Institute of Great Britain and Ireland. London.
Anthropologische - Ethnographische Sammlung. Berne.
Anthropologischer Gesellschaft. Berlin.
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Asiatic Society of Bengal. Calcutta, India.
Auckland Institute. Auckland, N. Z.
Australian Museum. Sydney.
Boston Public Library.
Boston Society of Natural History.
Brooklyn Institute of Fine Arts and Sciences.
California Academy of Sciences. San Francisco.
Cambridge Philosophical Society. England.
Canterbury Museum. Christchurch, N. Z.
Carnegie Museum. Pittsburg, Penn.
Colonial Museum. Wellington, N. Z.
Columbia University Library. New York.
Connecticut Academy of Arts and Sciences. New Haven.
École d'Anthropologie de Paris.
Field Columbian Museum. Chicago.
Free Museum of Science and Art. Philadelphia.
Geological Survey of New South Wales. Sydney.
Gordon Technical College. Geelong, Australia.
Harvard University Library. Cambridge, Mass.
Hawaiian Evangelical Association. Honolulu.
Hawaiian Historical Society. Honolulu.
Hilo Public Library. Hilo, Hawaii.

Honolulu Library Association. Honolulu.
Indian Museum. Calcutta, India.
Jardin Botanique de Buitenzorg. Buitenzorg, Java.
Johns Hopkins University. Baltimore.
K. K. Naturhistorische Hofmuseum. Wien.
Kgl. National Museet. Copenhagen.
Kongl. Vitterhets Historie och Antiqvitets Akademien. Stockholm.
Königliche Ethnographische Museum. München.
Königliche Museum für Völkerkunde. Berlin.
Königliche Zoologische und Anthropologisch-Ethnographische Museum. Dresden.
Leland Stanford Jr. University. California.
Library of Congress. Washington.
Linnean Society of London.
Linnean Society of New South Wales. Sydney.
Madras Government Museum. Madras, India.
Marine Biological Association of the United Kingdom. Plymouth.
Maryland Geological Survey. Baltimore.
Mexico Instituto Geologico. Mexico.
Museo Civico di Storia Naturale di Genoa.
Museo Nacional de Buenos Aires.
Museu Goeldi. Para, Brazil.
Museu Paulista. Sâo Paulo, Brazil.
Museum of Comparative Zoology. Cambridge, Mass.
Museum of Fine Arts. Boston.
Museum für Natur-, Völker- und Handelskunde. Bremen.
Museum für Völkerkunde. Leipzig.
New Zealand Institute. Wellington.
Oahu College. Honolulu.
Oberhessische Gesselschaft für Natur- und Heilkunde. Giessen.
Peabody Academy of Science. Salem, Mass.
Peabody Museum. Cambridge, Mass.
Philadelphia Commercial Museums.
Polynesian Society. Wellington, N. Z.
Public Museum. Wanganui, N. Z.
Real Academia de Ciencias y Artes de Barcelona.
Red Meteorologica y Revista cientifica del Estado de Mexico.
Rijks Ethnographisch Museum. Leiden.

's Rijks Museum van Naturvlijke Historie. Leiden.
Royal Geographical Society. London.
Royal Society of Edinburgh.
Royal Society of New South Wales. Sydney.
Royal Society of Queensland. Brisbane.
Royal Society of South Australia. Adelaide.
Royal Society of Tasmania. Hobart.
Royal Society of Victoria. Melbourne.
Smithsonian Institution. Washington.
" " Bureau of American Ethnology. Washington.
" " U. S. National Museum. Washington.
Società Italiana di Antropologia e Etnologia. Firenze.
Société de Anthropologie. Paris.
Société Royale des Antiquaires du Nord. Copenhague.
Société Royale Malacologique de Belgique. Bruxelles.
South African Museum. Capetown.
South Australian Museum. Adelaide.
U. S. Experiment Station. Honolulu.
Universiteit van Amsterdam.
University of California. Berkeley, Cal.
University of Kansas. Lawrence, Kansas.
University of Montana Biological Station.
University of Pennsylvania. Philadelphia.
Wytsman, P. Bruxelles.
Yale University Library. New Haven.

Noteworthy Hawaiian Stone Implements.

BY WM. T. BRIGHAM.

SINCE the publication of the account of the Hawaiian Stone Implements, in the Memoirs of this Museum, Volume I., my attention has been called to several not there mentioned, and which are in private hands. The first one is a very interesting specimen belonging to Hon. S. M. Damon, and found on his estate of Moanalua. In the southern and Micronesian groups, where breadfruit is a far more important food than on the Hawaiian Islands, tools of various forms, often made of wood, are used to split the rather tough fruit of the Artocarpus, but I had never before seen any especial Hawaiian tool for this purpose. I recalled a photograph of a similar stone tool in the British Museum, which I had supposed came from some southern group, as no name was on the photograph; but my friend Mr. J. Edge-Partington, of that institution, has kindly sent me an outline drawing which shows clearly the same form. The specimen in the British Museum is undoubtedly Hawaiian, and the Damon specimen establishes this as a regular Hawaiian tool, and not a solitary form. The length is 7.5 inches. Mr. Damon has kindly allowed the Museum formator to make a cast of this most interesting specimen. Fig. 1 shows this tool. Another new form is the adze represented in Fig. 2. While the general form is not unusual, the cutting edge is curved and would act as a gouge, or cut a groove. The specimen, with the next, is in private hands, and both were found on Kauai.

In the Memoir mentioned the suggestion was made that the ring poi pounders of Kauai might be a development of the simpler stirrup form, which is far less common than the ring or pohaku puka. The curious specimen shown in Fig. 3 is intermediate between these two forms; the two horns and the concave side are retained, but the hole has been pierced, and the resulting tool might be used as a pounder or as a grinder. Very likely farther discoveries may produce a series, or in fact complete the series already in hand. All these transition forms have been found on the island of Kauai. It is hoped that at no distant day both the gouge-like adze and this interesting pounder will be added to the treasures of this Museum,

and in the meantime the illustration, Fig. 3, will preserve its form from oblivion in case the original should be lost, as has been the fate of many curious specimens in private hands.

It has sometimes been claimed that the Hawaiians always sharpened their stone cutting tools on flat or very slightly concave

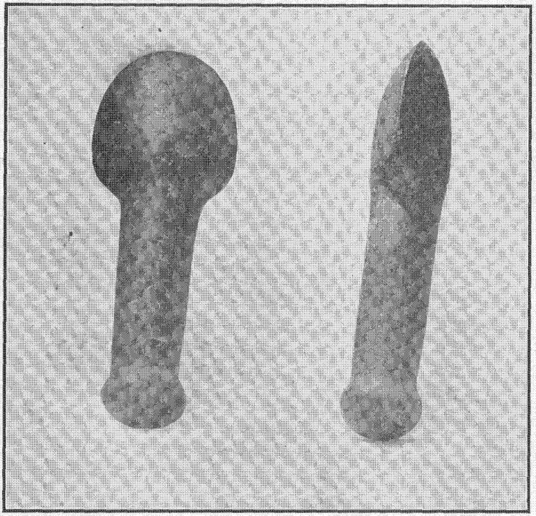


FIG. 1. BREADFRUIT SPLITTER.

surfaces. While the breadfruit splitter shown in the first figure could have been shaped, polished and sharpened on such a grindstone, it would be difficult to so sharpen gouges and the gouge-like adze of Fig. 2. In fact, for such purpose the Hawaiians used, as did other primitive people, grooved stones; and one grindstone with several grooves, given by Mr. G. R. Ewart, is now in the Museum. I have seen others and am sure that the old Hawaiians

were in no way behind their brethren in the stone age in all that pertained to polishing, or sharpening tools.

It is not impossible that the round edge adzes as well as those with the edge at an angle with the longitudinal axis, as in a turner's chisel, were used to pick out the interior of bowls or umeke. The inside in several specimens of partly made bowls in this Museum shows marks of similar tools or picks.

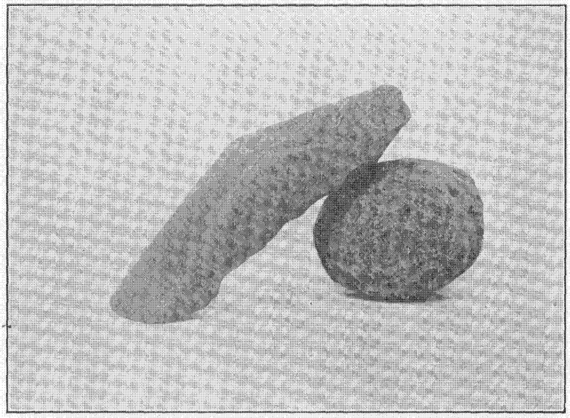


FIG. 2. ADZE WITH CURVED EDGE.

To return to the stirrup poi pounders: in a private collection on Kauai are two of this class of pounders that present an unusual curvature. The horns at the top are well developed and the convex side is greatly curved, round shouldered in fact, throwing the horns well over the concave side. In handling these specimens I could not see any advantage in the form; indeed it seemed rather clumsy than otherwise, although the workmanship of the tool was good. Both were found at Wahiawa on Kauai. My photograph of these stones was not sharp enough for reproduction.

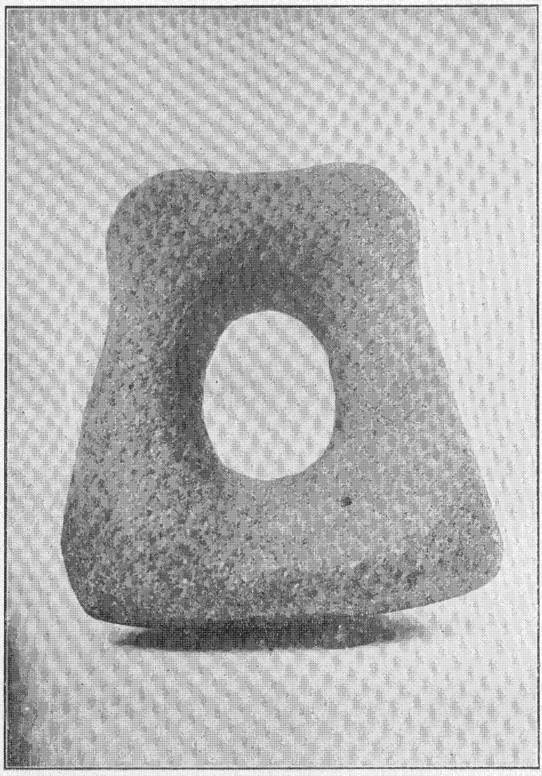


FIG. 3. KAUAI POI POUNDER.

The Fibres of the Hawaiian Islands.

By Leopold G. Blackman, of the Museum Staff.

The cultivation of fibre-yielding plants has of late years been one of rapidly increasing importance. The subject has for some time received exhaustive research in the United States where the total annual importation of raw and manufactured fibrous materials approximates in value the sum of $100,000,000. The demand for many forms of fibre manufactures, particularly those used in binding, has, it is asserted, always been in excess of the supply, and at the present time is increasing at an extraordinary rate. This, coupled with the decline and deterioration of flax and hemp culture in European countries, has caused a great stimulus to investigation as to the value of new fibres and the possibility of supplying the demand with products of home origin.

It will be the endeavor of this paper to present briefly a review of various fibres, particularly those of native Hawaiian origin and those of possible introduction to these islands. Attention will also be directed to what success has already been achieved in fibre culture in Hawaii and the result given of experiments conducted at the Museum on the preparation and testing of various kinds.

It is worthy of note that the most important fibres of today were the staple ones of ancient times. Flax, cotton, hemp, and the host of palms, grasses and reeds of commerce all boast a remote antiquity. It has often been remarked that no new species of domestic animal has been added to our possessions since the dawn of history, and this statement with some limitations may be advanced with respect to fibres. Even the recently introduced Sisal hemp was in use by the Aztecs, and the till late little known China grass was utilized in the Orient so far ago that all record of its origin is forgotten. The earliest fibre which is known to have been cultvated is flax. Fragments of linen fabric have been found among the prehistoric remains of the Swiss Lake-dwellers, a people coeval with the mammoth. The cere cloth used by the ancient Egyptians in the preservation of their dead was linen, and the monuments of this historic people depict the full process of its manufacture. The

records of cotton are no less ancient, and Herodotus writes, "There are trees which grow wild in India, the fruit of which is a wool exceeding in beauty and quality that of sheep. The Indians make their clothes of this tree wool." (Herod. iii, 106.) The ancient Hebrew writings are full of references to spinning and weaving. White and violet hangings of cotton are described in Esther[1] as adorning the king's palace, and the failure of flax is recorded by Hosea (ii, 9) as among God's punishments. The Hindus have, from time immemorable, been conversant with the manufacture of the most exquisite muslin, which derives its name from Mosul, a city famous for its manufacture, on the Tigris. The ancient cities Calicut, Damascus and Nanking point to the early origin of the fabrics to which they have given their names. The use of papyrus was well known to the Egyptians, and Pliny mentions its use by these people for their matting and sails, and small boats are even said to have been made of it.

All fibres suited for weaving are characterized either by irregularities in their surface, which take the form of serrations or dentations to prevent the individual fibres from slipping one upon another, or they possess a more or less tendency to twist and curl. In addition to these structural peculiarities the commercial value of a fibre depends directly upon many other characteristics, chief of which are the length, strength, flexibility, texture and color of the filaments, together with their composition, facility of cultivation and capacity for bleaching and taking dyes.

Vegetable fibres consist as a rule of woody cylindrical cells, generally overlapping one another and traversing the structure of the plant to give it rigidity and strength. Wood cells occur most plentifully in the bast layer which underlies the true bark. As, however, Dicotyledonous plants are the only ones that possess a true bark it is only this class of plant which yields bast fibre. Among the chief bast or cortical fibres of commerce are flax, hemp and jute.

In Monocotyledons the fibrous cells are incorporated with the fibro-vascular bundles which occur throughout the body of the stems and leaves, forming, as it were, the supporting structure of the plant. These bundles deprived of their soft cellular matter

[1] Esther i, 6. The Hebrew *carpas*, Greek κάρπασος, Sanscrit *karpâsa*, was used to denote either cotton or flax, and recent authorities render this passage describing the palace of Ahasuerus (Xerxes) at Susa "white and violet hangings of cotton."

afford another class of fibres which may be called "structural" or "foliaceous." Among the chief of these are Manila hemp, coir, sisal and pita.

A third class of fibres is obtained from the down or hair surrounding the seed or seed capsule of certain plants. The most important of these is cotton, which is produced in bolls contained in the seed envelope of various species of *Gossypium*.

The method of separating fibres from the plant depends materially upon their structure. As a general rule the process involves steeping or macerating in water (termed "retting"), beating and scraping (known as "heckling"), washing, drying and bleaching. With certain fibres some of these processes may be unnecessary, but in broad terms the manufacture of fibre may be said to embrace them all. Modern machinery is making important changes and introducing new methods and economy of time and expense. Before the introduction of mechanical aid the preparation of fibre was necessarily slow and laborious. In former times retting appears to have played a more important part than now, nearly all fibres being first subjected to this treatment; that of the coco palm, known as coir, was allowed in some instances to macerate for two years. The process of retting is now not so often resorted to, as it is found that it injures the quality of the fibre both as to strength and color: it must, however, always form a necessary part in the preparation of some fibres.

In extracting fibres by hand, bast varieties are best obtained by gently beating the bark with a wooden mallet to loosen and separate the filaments. These should then be thoroughly washed and freed from extraneous matter and then immersed for a greater or less time in water until the fibre can be cleaned from impurities. The preparation is completed by such drying and bleaching as is required.

The process of hand preparation of structural fibre follows much the same lines as are required for bast ones. With pulpy plants, such as the agaves and plantains, retting may be dispensed with altogether, and fibre obtained in this way usually commands a better price on the market. As a rule the more quickly the sap and pulp be removed after cutting, the cleaner and stronger the fibre. Clearness and texture often form a good criterion as to strength.

From an economical standpoint fibres may be classified according to their use. Cotton, flax, pineapple and ramie are finer fabric fibres, while jute and coir are used for matting and sacking. Threads, twines, ropes and cordage are supplied by flax, hemp, plantain and sisal, and the various manufactures of brooms, paper, nets, mats and baskets are made from a host of sedges, reeds, bambus, palms, seaweeds and other plants.

Of the many hundreds of useful fibre-producing plants probably less than forty supply the markets of the world. It is believed that these Islands may be made abundantly productive of fibres adapted to every description of manufacture, from the coarsest sacking to the most delicate muslin or lawn.

Although the usual arrangement of the fibres noticed in this paper would be a division founded on their structure and botanical classification it has seemed better in this case to adopt a different method. A brief description is first given of the standard commercial fibres, flax, hemp and jute, as it is by these a comparison is drawn to the quality of other and less known varieties. The fibrous plants native to the Hawaiian Islands and the introduced ones then follow in alphabetical order. The importance of botanical origin has not been entirely overlooked and attention is in each case directed to this. The following fibres have been described:

BAST OR CORTICAL FIBRES: Cotton, Flax, Hemp, Hibiscus (hau), Jute, Mulberry, Okra, Oloná, Pandanus (hala), Ramie, Rosella and Sunflower.

STRUCTURAL OR FOLIACEOUS FIBRES: Bambu (ohe), Coir (niu), Manila Hemp, New Zealand Flax, Pineapple, Pita, Sansevieria and Sisal.

SURFACE FIBRES: Cotton and Pulu.

FLAX.

EXOGEN. BAST FIBRE. *Linaceæ. Linum usitatissimum.*

Flax is believed to be the earliest vegetable fibre used by man for clothing, and its cultivation and manfacture are known to have been followed for at least five thousand years, *Linum angustifolium* being the reputed source of the prehistoric fabric of the Stone Age. More than one hundred species are recognized, of which *Linum usitatissimum* affords the flax of commerce. The *Linaceæ* are dis-

tributed throughout the world, being found principally in temperate zones. The commercial variety is grown extensively in Great Britain, Sweden and most other European countries, the finest flax being produced in Belgium. Considerable success has awarded the growth of this plant in the United States, but its culture is on the whole technical and beset with many possibilities of failure. Specimens of flax grown by Mr. A. F. Cooke at Palolo have been examined and a fair sample of fibre was obtained. Mr. Cook is experimenting in this direction and looks to obtain three harvests a year.

HEMP.

EXOGEN. BAST FIBRE. *Urticaceæ. Cannabis sativa.*

The term "hemp" is used commercially as indefinitely and generally as the word "fibre." It has almost acquired the position of a generic name, and seldom appears without such a descriptive prefix as Manila, Sisal, Indian, Russian, Sunn, and a host of others which refer to fibres of utterly distinct origin. Correctly speaking the term "hemp" should only be applied to *Cannabis sativa*, an annual herbaceous shrub of the *Urticaceæ*, a well known fibre-producing order which also furnishes two other invaluable materials, ramie and the less known Hawaiian oloná. The cultivation of true hemp has been followed from the earliest ages in India and Persia, and it is now grown extensively in S. Russia, Hungary, S. Europe, Asia, China, tropical Africa and S. America, where it flourishes well in altitudes of from 4000 to 10,000 feet; but as the production of good fibre demands careful and liberal attention and a rich soil, it is unlikely that hemp will ever be grown commercially in Hawaii. The preparation of the fibre follows the general lines of that required for other bast varieties. Although innumerable patents have been issued to inventors of hemp-preparing machinery none have been entirely successful, and its manufacture is still chiefly by hand and as a rule expensive.

Forty years ago the United States produced 75,000 tons of hemp which in 1895 had fallen to about 5000. This decline is due chiefly to over-production and the competition of the less expensive though somewhat inferior Manila and Sisal hemps. As a cordage material true hemp is unrivalled, and its use is chiefly directed to the various manufactures associated with this term and to the weaving of sail cloth and canvas of different textures, which

latter article derives its name from the Greek word *cannabis*. The following reference is to hemp: "I never heard the like termes given to any simple as you give to this; you call it neckwede."

In India the well known intoxicating liquor "bhang" or "hasheesh" is prepared from cannabis and is used by all classes, Moslems and Hindus alike being said to indulge in its insidious intoxication to a great extent.

JUTE.

EXOGEN. BAST FIBRE. *Tiliaceæ. Corchorus capsularis.*

Jute is derived from a shrub which grows wild throughout India where it has been cultivated from early times. It has been introduced successfully to favorable parts of the United States and would probably grow well in these Islands; but its culture here is unlikely in view of the very many superior fibrous plants readily adaptable to this climate. The culture of jute, however, is stated in the Cyclopedia of India to be easier and more profitable than that of rice. The chief commercial jute manufactures are sacking (Bengali, *goni*, which suggests the word "gunny") and packing cloth. It is also used extensively in admixture with wool and other articles in the production of an inferior kind of carpet.

BAMBU.

ENDOGEN. STRUCTURAL FIBRE. *Gramineæ.*

Among the important fibre plants of the world is bambu, the most gigantic of the grasses, which varies from the size of a slender reed to that of a small palm. The climate of Hawaii is adapted to many of the bambus,[2] but no attempt is made to take advantage of this commercially. Many varieties would flourish among the deep moist valleys of these Islands where little else of value could grow, and their slender poles and stems should find a ready use not only among our oriental population, but in the general manufacture of varied domestic articles. The number of uses to which the bambu is applied in China and other eastern countries is indefinite. The useful "India paper" is made from the leaves and shoots; its strong upright posts are used for the framework of houses, while other parts

[2] *Bambusa vulgaris* is found wild on all the larger Hawaiian islands, and perhaps eight or more species are found here in gardens.

of the plant furnish the walls, floors and thatch. It is employed in the construction of ships and bridges, and for every conceivable article of household furniture. Ropes, ladders, water conduits, outriggers, baskets, fans and hats only suggest some of the uses of this invaluable plant. The process of paper making from the bambu in China is simple. A thin layer of split stems is placed in a tank, and upon these a layer of lime. Alternate bambu and lime layers are continued until the tank is full, when water is admitted and the whole allowed to remain till the bambu is thoroughly disintegrated. The pulp is then pounded in a mortar and spread in layers to dry.

The papyrus, another useful grass, grows well in this climate and is found in many gardens. The paper of the Egyptians was prepared by removing the central pith from the stalk and laying the strips side by side; another layer was placed at right angles to the first and the whole soaked in water, pressed and dried.

BOW STRING HEMP.

ENDOGEN. STRUCTURAL FIBRE. *Liliaceæ. Sansevieria zeylanica.*

This remarkable fibrous plant belongs to the same order as New Zealand flax and the Yuccas. It grows extensively in India, Java, Guinea and China, and the tenacity and durability of its fibre has commended it to the natives of many countries for their bow-strings. The plant is a stemless perennial bearing a rosette of radical leaves, smooth, erect, linear-lanceolate, copiously maculated on each side with a lighter shade of green. Its florescence is racemose, resembling the agaves.

The fibre of *Sansevieria* possesses in an eminent degree those properties demanded of a successful textile or cordage material. It is white, fine, soft, pliant and lustrous, resembling pineapple fibre in many of these attributes. Its elasticity is great, and its resistance to moisture is more pronounced than that of hemp. In tenacity this fibre is about equal to Sisal, which it surpasses in most other qualities. The cultivation of sansevieria is simple, as it requires no care. The gardens of Honolulu contain many evidences of the plant's adaptability to this climate. The propagation is by division of the rhizomes or the leaves may be cut in lengths and inserted two inches deep in boxes, when after a few weeks they will develop fibrous roots and suckers will be put forth. The

plants soon become well established and a full crop may be harvested in about two years. By judicious arrangement of the plants in succession of growth the output of fibre may be made continual, and a plantation worked through twice a year. After each cutting the growth becomes denser, and it is said that the plant will in time eradicate everything else. A plantation may be cropped for many years without renewal, and need fear no extremes of rain or drought, as sansevieria appears indifferent to either.

The preparation of this fibre is similar to that of sisal, the native hand method consisting of removing the parenchyma with a blunt instrument and the usual process of washing and drying. Forty pounds of leaves from three to four feet long are said to yield one pound of dry fibre; and two crops, consisting in all of about 3500 pounds, may be expected from an acre of about 3000 plants. An experiment conducted under favorable circumstances on a small scale yielded a proportion of 13 tons per acre. The value of sansevieria may be taken as greater than that of sisal. The introduction of the cultivation of sansevieria fibre to these Islands appears to be one of exceptional promise. The adaptability of this plant to the Hawaiian climate, its rapid continuous and vigorous growth, its quick and abundant harvest, its easy production and value assure it a promising future and the consideration of enterprising capitalists.

COIR.

ENDOGEN. STRUCTURAL FIBRE.. *Palmæ. Cocos nucifera.*

Coir is a fibre produced in the husk surrounding the fruit of the coconut palm. This plant is said to be indigenous to Southern India, but it is found extensively in all tropical countries. The fibre is in general use throughout the Pacific, India and the West Indies, where it is used by the natives for matting, cordage and other purposes. In the native preparation of coir the husks are removed from the almost ripe nuts by tearing them on an iron spike fixed upright in the ground. One man is said to be able to shred by this means one thousand nuts a day. The husks are thrown into pits to disintegrate by maceration and decomposition, a process occupying in some cases as long as two years. The fibre is finally separated from other matter by scraping, beating and washing. The coir produced in the Laccadive Islands is considered the

best, and its preparation is said to be almost exclusively in the hands of women. The husks are there soaked for but a few days and the fibre is separated by gentle beating and scraping. When dry the coir is arranged into a loose roving which is stated by Watt to be twisted by hand in an ingenious way which yields two strands simultaneously.

The quality of coir fibre depends partly upon the maturity of the nut at the time of gathering and partly upon the care bestowed upon its preparation. It is used commercially in the manufacture of ropes, cables, matting, coarse carpet, brushes and brooms, and is a good substitute for oakum for caulking ships. In strength coir cordage is greatly inferior to Manila hemp, but surpasses it in elasticity. It is remarkable that the preparation of such a marketable commodity as coir is neglected in Hawaii. With care a good revenue might be derived from the coco-palm, as besides coir a valuable oil is yielded. The leaf stalk when split and drawn through perforated steel plates yields a clean durable material well suited for basket work.

COTTON.

EXOGEN. SURFACE FIBRE. *Malvaceæ. Gossypium.*

Cotton fibre consists of fine tubular hair-like appendages which surround the seed of various species of *Gossypium*. It is of a clear white color and occurs irregularly contorted. Cotton furnishes clothing to millions of people in India, and is the chief fibre manufactured for ordinary clothing fabrics. Its cultivation has been established from the earliest times, and its product has always found a place in the markets of the world. Before the conquest of Mexico by Cortez that country produced upwards of 100,000,000 pounds of cotton annually, but its culture was neglected and ultimately abandoned under Spanish lethargy. In the United States the rapidity of the increase of the cultivation of this article is remarkable. At the beginning of last century about 10,000 bales per annum were produced, which at the close of the century had grown to about 8,000,000 bales. The magnitude of the cotton industry may be estimated when it is known that the value of the raw fibre produced in the United States is about $160,000,000, which is converted by manufacture into material approximating $300,000,000 in value. The quality of cotton consists chiefly in

the length of the filaments, "long staple" measuring from one to one and a half inches, and "short staple" averaging less. The climate of these Islands is well suited to the growth of cotton, *Gossypium tomentosum* and *G. drynarioides* being both indigenous to these Islands, but of little commercial value on account of their short staple.

During the War of the Rebellion considerable quantities of cotton were grown in Hawaii and exported to America, but for many and obvious reasons it will probably never again rank among the exports of this territory. It grows well on most soils, but not equally so on all and requires a summer long enough for it to mature. The strong cortical fibre of the cotton plant has lately been the subject of experiment, and for some time it was fondly imagined that an additional profit would be derived from this source by plantations devoted to the cultivation of surface cotton. The failure of these attempts is generally admitted, as no machine can operate upon the tough, gnarled stems of the plant grown for ordinary cotton. To derive commercial bast fibre from this plant would demand an entirely different culture, entailing the rapid growth of straight long stems from closely set seeds.

HIBISCUS.

EXOGEN. BAST FIBRE. *Malvaceæ.*

The hibiscus is a very large group of plants belonging to the *Malvaceæ*, an order remarkable for its fibres, which include cotton and okra. They are widely spread over the warmer regions of the globe and are very generally used by the native races for cordage, mats and allied manufactures. The florescence of the various species of *Malvaceæ* is generally large and showy, the different whorls being arranged in divisions of five. The flowers of the cotton, garden hibiscus, hau, hollyhock, mallow and marshmallow are well known. The most generally known tree of this genus is probably *Paritium tiliaceum*, which occurs abundantly in the Pacific and is the native *hau* of these Islands. It is now grown chiefly for its generous shade and is often seen trained to form lanais and arbors. Its fibre is tough and pliant and was formerly used extensively by the natives for mats and cordage, while its light wood afforded the *iako* of their canoes and the handles of their adzes.

Hau fibre is not equal in strength to hemp, or even good jute, but its tenacity is greatly increased by moisture. It may easily be obtained by beating, maceration and washing.

Hibiscus sabdariffa is in general cultivation in India and has been introduced to these Islands. Its fibre is known as Rosella hemp, and samples prepared at the Museum were found to be soft, fine and pliant, and slightly superior in strength to those of hau. The fruit of this plant ripens freely in Honolulu and makes a delicious sauce, resembling cranberry in appearance, color and flavor. Its leaves are said to be used in India for salads. Neither of these plants is likely to repay culture for fibre in Hawaii. *Hibiscus esculens*, see Okra.

MAGUEY.

ENDOGEN. STRUCTURAL FIBRE. *Amaryllidaceæ*. *Agave americana; A. mexicana.*

Various species of *Agaves* occurring in Mexico and Central America of use as fibre-producers have received the generic native name of Maguey, the products of the two above named being perhaps the best known. It is important to distinguish these fibres from the more valuable pita, the product of *Furcraea gigantea*, with which they are popularly but erroneously associated. *Agave americana*, the American aloe, or century plant, is often grown in gardens for its decorative effect, but its true fibrous qualities are greatly impaired by a too generous soil, which a rigorous habitat fully develops. *A. mexicana* yields the intoxicating beverages pulque and mescal, the former of which is prepared in Mexico in the following manner. When the leaves commence to become yellow a small aperture is made at the base of the leaf into which a tubular gourd is inserted from which the air is exhausted and the sap removed by suction. The fluid is then emptied into sheep or pig skins and fermented in vats, where it assumes an opaque white color. Its taste is at first unpalatable to white people, although they are said to overcome their distaste in time. Watt estimates, in 1889, that 50,000,000 bottles of pulque were annually consumed in the city of Mexico, and that 20,000 mules and donkeys laden with this beverage entered the city monthly. Squier describes the preparation of pulque in a different manner, and, writing in 1863, says that the central stalk, just before florescence, is cut away and a

reservoir formed by scooping, into which the sap exudes. He relates that one plant will afford beverage for two months, and will furnish in all between two and three hundred gallons of pulque.

The fibres obtained from these agaves are of good quality. Their cultivation and preparation closely resemble those of pita and sisal, to which fibres they are similar but rather inferior. They have been cultivated with fair results in various countries, but in view of the better grades of similar fibres, above mentioned, it is improbable that they will ever be widely grown.

MANILA HEMP.

ENDOGEN. STRUCTURAL FIBRE. *Scitamineæ. Musa textilis.*

Of all substitutes for true hemp the fibre extracted from the wild banana or plantain is probably the most important. In the Philippines, where the plant is indigenous, a large industry is carried on in the manufacture of "abaca" cloth from the finer qualities of banana fibre, the coarser material only being reserved for export. A rich volcanic soil is best suited to the culture of the abaca, the most satisfactory results being produced on high land subjected to a regular rainfall, as drought is most detrimental to the crop. In the Philippines the manufacture of the fibre is almost entirely by hand, one man preparing about twelve pounds a day, for which he receives one-half. From one to two tons of fibre are obtained from an acre of land, according to the method of preparation, which is, on the whole, wasteful, as only about one pound is obtained from each plant. The fruit, being inedible, is not allowed to ripen, the flower being removed as soon as protruded. When the plant is once cut it is important to remove the fibre without delay. The discolored outer petioles are first removed and discarded, and the successive ones are placed upon a flat board and the inner side scraped with a blunt instrument. When all the pulp has been removed the strip is turned and the scraping continued on the other side. Repeated washings and scrapings free the fibre from extraneous matter, and it is then hung in the wind to dry. Crude apparatus, consisting of a fixed horizontal knife upon which the fibre is pressed by a parallel bar, is also in use in some parts. Manila hemp is of great strength and durability and has earned for itself the first position as a cordage fibre. A substitute for horse hair is

manufactured from this fibre dyed with copper and logwood—a deception also practiced with coir. The excellent paper known as "Manila" is made from the waste fibre of the abaca.

The banana grown in these Islands for fruit is chiefly *Musa paradisica* and its varieties, and experiments have been undertaken at the Museum to ascertain the value of the fibre yielded by this plant. A quadrant longitudinal section of an eight-foot trunk was immersed in water and samples of fibre were extracted at different periods of maceration. The first sample was prepared before immersion and the fibre obtained was of a beautiful glossy white color. As the process of maceration continued the fibre gradually lost its lustre and whiteness till after ten days, when the last was taken, the color had assumed a dull grayish brown. The same deleterious effect was noticeable in the strength of the fibre, although by no means to so pronounced an extent; a marked deterioration, however, was apparent in this respect between the first and last samples. The fibre was also found to vary in texture according to its position in the trunk, that occupying the outer verticils being coarser, the finer being reached by regular graduation towards the centre. The strength also varied in this respect as regards separate filaments, although a yarn of the fibre was of at least equal strength to one of the same size made from the coarser. The strength of this fibre was determined to lie between that of pita and jute, and it should be well suited for coarse cloth, binding twines and paper. The experiments resulted in the production of almost four per cent. of good length fibre, with the addition of about one per cent. of shorter and inferior waste, of use for tow and packing material. The variations of strength and size of the filaments, which has been remarked, is also to be found in the market samples of Manila hemp. This, as has been stated, is chiefly due to the position in the plant from which it has been taken, and careful manufacture should obviate these differences and produce fibre of more uniform quality. The contrast between Manila hemp and sisal in this respect is remarkable.

The chief conclusion deduced from these experiments was that the banana growers of these Islands are wasting large quantities of saleable fibre. As an additional product to the fruit, the harvesting of the fibre should be profitable. Probably the most practical means of dealing with the question would be to establish a fibre

mill in the banana growing district. Arrangements could no doubt be made with the growers for the purchase of their waste stems at a nominal sum. Hawaii at present offers a most promising field for a mill of this kind, as it would not only have at its disposal the banana stems, but also the trash of the cane fields and the waste sisal pulp, all of which are most excellent paper materials. An opportunity such as this cannot for long be ignored, and a paper mill must surely soon be established to utilize these almost limitless resources. A hybrid between *Musa textilis* and *M. paradisica* would probably yield useful results in both fibre and fruit, but it would be most difficult to secure. The same objections which are urged against this dual object in the case of the pineapple do not appear to apply to the banana. It may be remarked that *Musa textilis* produces a quantity of well developed seed from which it may readily be propagated.[3]

NEW ZEALAND FLAX.

ENDOGEN. STRUCTURAL FIBRE. *Liliaceæ. Phormium tenax.*

This flag-like plant, bearing a flower stalk like the aloes, is native to various parts of Australasia, especially to New Zealand whence it derives its name. Captain Cook first introduced this useful fibre to Europe, which he describes as "of the nature of flax or hemp, but superior in quality to either." It may perhaps be due to these words that the term flax has unfortunately been applied to the fibre of this plant, an altogether erroneous term, the true flax being a bast fibre. A very extensive use is made of New Zealand flax by the Maoris. From the flowers they derive a pleasing beverage; the base of the leaves affords a gum which is of value commercially; the pith is used as tinder and to convey fire; the leaves are used entire to write upon with a sharp instrument, and split to form straps, and to make excellent baskets. The fibre is manufactured into garments and mats.

[3] An interesting account of the cultivation and manufacture of Manila hemp has, since the above was written, been published by Mr. W. M. Giffard of this city, which is well worthy of attention from all interested in this subject. A bulletin recently issued by the Philippine Bureau of Agriculture, and reprinted for this Territory by Mr. Jared Smith of the Agricultural Experiment Station, should also be read. The conclusions derived from the above mentioned articles, and indeed all literature on Manila hemp, are that the conditions of soil, situation and climate in Hawaii are eminently favorable to the successful introduction of the cultivation of this fibre on a large scale. Mr. Smith considers that the sites most suited for this purpose are the windward districts, and mentions in particular Hanalei, Kauai; Nahiku, Maui; Hilo, Puna, Olaa, and portions of Kau and Kona on Hawaii.

In New Zealand this plant grows spontaneously in almost any soil or locality, the best fibre being dependent upon a favorable site, free from excessive moisture. It has been introduced to many countries and is said to grow readily as far north as Scotland. California seems well suited to New Zealand flax, and it also adapts itself well to these Islands. The Cyclopedia of India states that it is particularly suitable for growing on old coffee land. The fibre of this plant is strong, flexible and of a clear white color. The preparation is by maceration, but a better article is produced by scraping, so applied as not to injure the cells. The human thumb nail has not yet been surpassed for this purpose. This fibre is suitable for manufacturing into almost all kinds of cordage and textiles, a cloth being prepared from it resembling linen duck.

OKRA.

EXOGEN. BAST FIBRE. *Malvaceæ. Hibiscus esculens.*

The Okra or edible hibiscus is a native of the West Indies, belonging to the same natural order as cotton and the native hau. It is grown in the Southern states for its pods, which afford the "gumbo" of culinary fame. The plant flourishes well in the Hawaiian Islands, and on account of the reputed value of okra as a fibre, enquiry has been made as to the possibilities of its profitable culture. The value of okra fibre has, however, been greatly over-estimated, and efforts to cultivate it have been productive of no satisfactory result. It is found to be brittle and inferior to that of other mallows in tenacity, possessing only half the strength of hemp. There is apparently no literature on the subject, and okra is known commercially chiefly by its unenviable reputation as an inferior adulterant of jute. It seems well proved that many plants can be grown more easily than okra whose fibre possesses much greater value; a paper called "banda" is, however, made entirely with this material.

OLONÁ.

EXOGEN. BAST FIBRE. *Urticaceæ. Touchardia latifolia.*

The most important of the native fibres, and indeed one of the best in the world, is Oloná. Allied to ramie, true hemp and the paper mulberry, it also enjoys the distinction of being the sole

species of its genus. The plant is a shrub of from four to eight feet in height which is found sparsely throughout the deep ravines of all these Islands. Oloná is greatly prized by the natives and its fibre is of extreme tenacity and value, resembling in most characteristics the remarkable ramie or China-grass. A varied assortment of native products of this fibre are in this Museum, chiefly in the form of fishing nets, differing greatly in design and size. The smaller ones were used by hand, and the largest for encircling large shoals of fish which were enclosed from canoes. The natives prefer oloná nets to any of foreign manufacture.

Oloná does not occur in sufficient quantities indigenously to permit its being gathered profitably in commercial quantities. There is no doubt that a ready market at high prices awaits this fibre, as its wonderful qualities render it invaluable in special instances. In the time of Kalakaua it was sold to European Alpine clubs and was in great request on account of its extraordinary tenacity. The plants are best cut when a little over a year old and their thick stems stripped of the loosely adhering bark. The natives spread the ribbons of bark on a long, narrow board and scrape away the extraneous pulp with a blade, usually of tortoise bone, shaped like a broad chisel. Oloná flourishes best in a deep shade with hardly any clearing, so that the plant might be easily propagated at small expense in most of the woods which occur at a sufficient altitude—from 1000 to 5000 feet being the most suitable height. An advantageous combination of the oloná and ramie industries could be made by planting the latter in open fields and the former in the uncleared woods. The adaptability of machinery for both of these fibres, and its comparative cheapness make such a venture accessible to small farmers. Ramie, oloná and coffee culture may fitly be classed together and termed white man's industries. They furnish an economic foundation for his existence and prosperity and flourish at altitudes which afford a salubrious climate. If these Islands be at all destined to become a white man's country such industries as these must be given most earnest attention. Experimental plantation of oloná is being made in many of these Islands, particularly in the woods of Olaa, and samples of the stem, bark and fibre have lately been forwarded for examination to the Agricultural Department at Washington.

PAPER-MULBERRY.

EXOGEN. BAST FIBRE. *Urticaceæ. Broussonetia papyrifera.*

The Paper-mulberry yielded the tapa or kapa cloth of the Polynesian races. Its cultivation was formerly conducted with great care, and the manufacture of the cloth was in the hands of the women. The plant is a small tree with large heavy leaves. For the preparation of the best cloth the tree was allowed to grow about twelve feet, when the bark was stripped and its external surface removed by steeping and scraping. The clean inner bark was then macerated and beaten upon a log of hard wood with a wooden mallet. The different strips of bark were welded together at the edges by beating, and the cloth was dyed, figured with pleasing designs and sometimes perfumed with aromatic plants. The whole process was an elaborate one, and the degree of texture obtained, the brilliancy of coloring, and the effective ornamentation are remarkable. This cloth in its various manufactures was an excellent substitute for wool or cotton. Its manufacture has now ceased in the Hawaiian Islands, and indeed throughout Polynesia. In Japan and Java the paper-mulberry is used to make a tough, durable paper; and *Morus alba* is used as a textile material in Italy.

PANDANUS.

ENDOGEN. STRUCTURAL FIBRE. *Pandanaceæ. Pandanus odoratissimus.*

The Lauhala or Hala of the natives belongs to the Screw-pines, so called on account of their spirally arranged leaves and the resemblance of the fruit to a pine cone. The family is dispersed throughout the Pacific, and also is found in the East African islands. The fibre of this plant is obtained from the leaves and is well suited for matting and sacking, but is little used for cordage. The leaves are first divested of their dorsal and marginal spines and then divided into strips. These are scraped with a blunt knife or shell and cleaned by immersion in water. Further careful scraping removes any roughness and gives the fibre a pleasing lustre. The fusiform aerial roots of the Pandanus contain a stronger fibre than the leaves, useful for basket work and whitewash brushes.

Many of the canoe sails, or rather mats, of the Pacific Islanders were made from this fibre, and also a great variety of mats, cordage, hut covering and netting.

PINEAPPLE.

ENDOGEN. STRUCTURAL FIBRE. *Bromeliaceæ. Bromelia sylvestris.*

One of the most useful and beautiful fibres is that yielded by the Pineapple, an almost stemless plant bearing a rosette of tenacious lanceolate leaves. The lustre, texture and strength of this fibre place it in the first rank with ramie and flax, and enable it to be woven into every quality of fabric from durable table cloths to the most delicate lawns. The celebrated Piña muslin or Batiste d'ananas of Manila is woven from this fibre and sometimes confused with China-grass cloth, from which it may be distinguished by its untwisted yarn. The pineapple is said, by some authorities, to be indigenous to Assam, and by others to Brazil. It was introduced to Europe early in the sixteenth century, and the rapidity with which its propagation spread is unparalleled in the history of fruit. The plant which affords the fibre of commerce differs in appearance from the edible variety chiefly in the unmassed ovaries of its fruit. In preparing the fibre by hand the operator sits astride a low stool and scrapes the leaves with a two-handled blade of bambu. When the fibres are exposed they are gathered together and detached with a steady pull. After washing they are placed upon bambu frames to dry and bleach. Pineapple fibre lends itself readily to a diversity of uses, and being impervious to moisture and consequent rotting, is particularly applicable to the manufacture of fishing lines and for stringing necklaces.

The culture of the pineapple for fruit is carried on with much success in Hawaii, the product of these Islands being conceded by some connoisseurs to be the best in the world. Much speculation has been turned to the possibility of utilizing the fibre from the waste leaves of the fruit plantations. It appears dubious whether any great measure of success will reward the endeavor to secure two so diametrically opposed ends as the simultaneous production of fruit and fibre from this plant, whose fibres penetrate not only the leaf but also the fruit. That the fibre of plants grown for the table could be used is certain, but its short length and comparative

low tenacity render it unsuited to most manufactures, except that of paper; but whether the installation of fibre-extracting machinery would prove remunerative is a problem that only experience will prove. On the whole the evidence goes to show that it would not, unless a more fibrous and longer-leafed variety of plant could be secured—a quality probably detrimental to the fruit; and the alternative appears to lie between either the simultaneous growth of poor fruit and poor fibre or an excellent quality of either produced separately.

PITA.

ENDOGEN. STRUCTURAL FIBRE. *Amaryllidaceæ.* *Furcraea gigantea.*

Furcraea gigantea is closely allied to the agaves and occurs throughout Central America. Its valued fibre, known as "Pita," has given rise to much confusion among authorities as to its origin; both Watt and Balfour attribute it to *Agave americana*, and a host of later writers have helped to perpetuate the error. This confusion may in part be attributed to the loose manner in which the word "pita" (as our own term "hemp") has been misused and applied to fibres of widely divergent origin; but it is highly desirable to restrict it to its legitimate use. In Mexico the cultivation of this plant antedates the Spanish conquest, and its fibre is still in use there for various cordage purposes, coarse cloth and sacking, and excellent netting hammocks and harness. In Mauritius its introduction has proved very successful, its yield there being about one and one-half tons of fibre per acre. Little attention has been given to this plant in the United States, although its excellent commercial possibilities merit it greater recognition. Specimens of the leaves of *Furcraea gigantea* about ten feet long were obtained from Professor Brigham's residence in this city, and yielded fibre of great length and excellent quality, of a beautiful glossy white color, well adapted to the better class of cordage manufacture. The fibre was prepared in a similar manner to other structural ones and resembled sisal in appearance, although its general qualities were perhaps superior to the latter. *F. gigantea* will flourish readily in these Islands, and in view of its success in Mauritius, Tobago and Trinidad, there appears every reason to believe that its cultivation on poor lands in Hawaii would at least be as remunerative as that of sisal.

PULU.

SURFACE FIBRE. *Cibotium chamissoi.*

A tree fern affords the soft glossy down, or vegetable silk, known as Pulu, which appears surrounding the base of the fronds. This fibre has been used extensively in California and Australia by upholsterers instead of feathers for stuffing mattresses and pillows. It has also been used to a limited extent in surgery in staunching bleeding. Pulu is gathered from the growing plant by hand and dried in the sun, a somewhat tedious operation. Twenty-five years ago Honolulu exported nearly a quarter of a million pounds of this fibre annually, but the industry has long since entirely ceased.

RAMIE.

EXOGEN. BAST FIBRE. *Urticaceæ. Boehmeria nivea*, China-grass, White ramie; *B. tenacissima*, Green ramie, Rhea.

Boehmeria is indigenous to India, and also probably to China. The *Boehmerias* are allied to the true nettles, from which they differ in possessing no stinging hairs. *Urticaceæ* especially abound in fibrous plants, yielding not only ramie or rhea, but also true hemp and the Hawaiian oloná. Certain external affinities, such as the arrangement of their closely serrate and hairy foliage are possessed in common by this order, the *Tiliaceæ* and the *Malvaceæ*, which together yield the majority of bast fibres. Much misconception is prevalent as to the varieties of *Boehmeria* yielding the fibre of commerce known as ramie, and there is great conflict of opinion in the literature upon this subject. It is highly desirable that an authoritative work be prepared on the various *Boehmeria* fibres, as attempts have in some instances been made to produce a fibre to compete with China-grass, from an entirely wrong species, and like mistakes have been made which have greatly retarded the development of the industry. The two chief varieties useful to commerce appear to be *Boehmeria utilis* or *tenacissima* and *Boehmeria nivea*. The latter is a temperate plant and has been cultivated from the earliest times in China, and is probably the true China-grass plant. The preparation of this fibre is entirely by hand and quite simple, but on account of the extreme tenacity of the filaments and their adherence to one another the process of man-

ufacture is tedious in the extreme. *Boehmeria tenacissima* is a tropical variety of the above and its fibre, often confounded with China-grass, should probably more correctly be known as rhea. This latter variety is well suited to the climate of these Islands, and is said to grow well in parts of southern Europe, while *Boehmeria nivea* is cultivated extensively in more northern latitudes. Of the fibres yielded by these two plants it is difficult without actual experience to determine which is better, although each has its enthusiastic supporters. For the sake of convenience the term ramie or China-grass will be used to include both of these varieties.

In many respects ramie may be regarded as the most remarkable of all commercial fibres. It is almost impervious to moisture; its strength exceeds that of all other vegetable fibres, and its fineness and lustre are surpassed by none. It has been used with good results in admixture with wool and silk, and in some cases is an excellent substitute for either of these materials, to which in its better qualities of manufacture it has sometimes been compared. Fabrics manufactured from ramie may be prepared to equal in durability and pliancy any made from either flax, jute, cotton or hemp. The capacity of this fibre for bleaching and taking dyes is excellent, and it will assume any desirable color. A collection of ramie manufactures in the Bishop Museum cover a wide range of uses and show that whatever has been achieved with other vegetable fibres may be equalled or excelled by this. The occurrence of a resinous gum in the stalks of ramie renders the separation of the fibre very difficult and requires abundant cheap labor. The production of the fibre has in consequence been limited to countries where such can be procured. Attempts at the manufacture of ramie in Egypt, Italy, France and America have never gone far beyond the experimental stage. The successful production of this fibre in commercial quantity has in consequence in these countries depended upon the invention of an economically practical decorticating machine, and the absence of such a device has brought the manufacture of ramie to a standstill. It now appears certain that the problem of successfully decorticating ramie in large quantities has been solved by a well known French engineer, who has invented a practically automatic and entirely successful machine. The decortication is said to be thorough without injury to the fibre. A field of ramie has been planted near Limoges (France) and the

stalks will be harvested and the decortication publicly conducted next July. An agency for these Islands has been established. The machine costs locally in France about $1200.

The adaptabilty of ramie to Hawaii has long since been proved, and with a satisfactory machine available the industry should soon establish itself here. It is confidently expected by many authorities that at no distant date this fibre will be the most important in the market.

SISAL.

ENDOGEN. STRUCTURAL FIBRE. *Amaryllidaceæ. Agave rigida sisalana.*

The Sisal belongs to a very large group of endogens familiarly known as Agaves. Its valued fibre is in consequence structural and is found permeating the fleshy leaves. The well known Century plant is another species of this genus. The Agaves are chiefly found in Central America, and their use was well known to the Aztecs who manufactured from the *Agave mexicana* a paper said to resemble the papyrus of the Egyptians. The sisal fibre of commerce is produced by the *Agave rigida sisalana*, a plant which has been popularly confounded with many others, particularly with *Agave decipiens*, whose chief claim to recognition is the persistence with which it has been mistaken in Florida and the Bahamas for the true sisal. This is remarkable, as many well defined characteristics separate the two species, of which may be mentioned the well developed footstalk of the false plant, and the sharp serrations of its leaf edges which render it difficult to approach. The leaves of the true plant are deficient of these spines except a very acute and obtrusive spur at the extremity, capable of inflicting a painful wound, which is removed to facilitate handling at the time of harvesting. The very young plants of the true sisal, however, show a well defined serration which entirely disappears as the plant matures, and which may suggest an interesting inquiry as to the evolution of the species. In this respect it is of interest to remark that the false sisal is found in the most inaccessible districts, whereas the true plant is not met with far from human habitation.

Sisal hemp cultivation was introduced to Florida from Yucatan in 1834, and subsequently to the Bahamas where considerable areas of otherwise unproductive land have been brought into cultivation and a lucrative commerce has been built up. The Bahaman

fibre is said to be in superior demand, and the industry is subsidized by a government bounty.

A well established sisal plantation and mill are in full operation near Honolulu and afford every indication of permanent success. Altogether about six hundred acres are cultivated and the industry is under the management of Mr. A. H. Turner, to whose energy the inception of the introduction of sisal fibre culture to these Islands is due. The fields exhibit every period of growth, from the nursery stage to plants four years old in an active state of production. A small plot of ground is also devoted to plants of about eight years growth, but these are older than the plantation and are among the first grown in these Islands. The sisal is propagated either by suckers or "pole" plants. Suckers spring from the root, but pole plants originate in the florescence, and exhibit a distinct form of development. At the age of about eight years the parent plant throws up a central stalk or "pole" sometimes to the height of twenty feet. On this a multitude of blossoms are produced, from each of which as it matures there develops a minute sisal plant which finally becomes detached and falls to the ground. Two thousand such plants may be obtained, at a moderate estimate, from one parent, and in some cases many more. During the last year the plantation in question has supplied about a quarter of a million pole plants to other growers. Besides these two ordinary methods of reproduction poles that have been cut down and allowed to wither have, when moistened by rain, put forth a number of new plants. Sisal exhibits remarkable reproductive power and vitality, and young plants which have been exposed to the sun unplanted for many months root quickly and vigorously as soon as set out.

Each successive stage of development is allotted its particular section of the plantation, which when visited had recently placed its first harvest of fibre upon the market. Japanese laborers were at work severing the leaves close to the stem of the plant and tying them into bundles of one hundred, after first removing their terminal spur. The leaves spring from the parent stock close to the ground and radiate upwards from a central crown. Those more nearly horizontal possess the most mature fibre, but all leaves which come within an angle of sixty degrees with the ground yield commercial fibre. Care is taken to separate leaves of under three feet length from those above, as a standard of two and a half feet

distinguishes the market limit of short and long fibre. After cutting, the bundles of leaves are drawn by mules to the mill where they are placed separately upon the bed or table of the machine by a Japanese who removes their binding cord. Another man lays the leaves in a row and guides them under the feeding chains which grip them at the centre and carry them beneath the first heckling wheel. This consists of a six foot wheel running at the rate of about 160 revolutions per minute, whose broad tire is crossed by transverse flanges or scrapers which crush and remove the pulpy mass from the leaf. A stream of water directed from above assists in this process and thoroughly cleanses the fibre. In this way one-half of the leaf is reduced to fibre, the other half having remained intact, held by the guiding chains. The part of the leaf first treated is now gripped by the chains and the half just released comes beneath another heckling wheel similar to the first and situated on the opposite side of the bed of the machine. The whole leaf is thus divested of its pulpy matter, and a woman stationed at the end of the bed receives the fibre as it is presented by the machine and places it ready to be carried to the drying ground. The whole process of extracting the fibre is concluded in a few seconds. About four per cent. of fibre is obtained, the remainder of the leaf consisting of fluids and heterogenous green pulp containing a proportion of short and inferior fibre. This is removed in carts, but it is intended soon to carry it away by a flume. At present no use is made of this waste which is considered to be of value as manure, or for the manufacture of paper. The short discarded fibre should make a good packing tow.

The Dictionary of the Economic Products of India (vol. i, 142) states: "The juice is made into soap. For this purpose it is expressed and evaporated either by artificial heat or simple exposure to the sun. On its reaching a thick consistency it is made into balls with lye ash. This soap lathers with salt as well as with fresh water. A gallon of sap yields a pound of soft extract." This interesting fact is supported by the Cyclopedia of India, which also states that "the split leaves are employed to sharpen razors, owing to the silica they contain. The roots are diuretic and antisyphilitic."

Upon arrival at the drying grounds the fibre is exposed to the action of the sun to dry. The most authoritative fibre literature lays stress upon conducting bleaching and drying in the shade and protected from the rays of the sun. It is found, however, at the

plantation that a good sun materially assists these processes. Whether the fibre may be injured by this means, in texture or some other property, is yet to be determined. A very ingenious method of exposing the fibre to the air is in use. A wooden rail framework has been erected at about five feet from the ground, and across this are stretched lines of doubled cord. Each line is firmly held at one end but is free to revolve from the other by attachment to a revolving swivel. In exposing fibre to dry a whisp is placed between the double line at the fixed end which is given a half turn and another whisp inserted. The process is continued the entire length of the line; by this means the fibre is securely held against wind or other accident and is easily removed by pulling. When dried the fibre is placed in a press capable of exerting a weight of a hundred tons, and packed into bales of about 500 pounds. Before the weight is removed from the bale the door of the press is opened and through grooves in the top and bottom wire is run and the bale securely bound. It is finally covered with gunny cloth, and is then ready for shipment. The mill is at present capable with one machine of an output of about a ton of fibre a day under favorable circumstances, such as when working on good length leaves. An ordinary day's work falls somewhat short of this.

With this evidence it seems safe to predict that the future of the sisal industry in Hawaii is assured.[4] Its abundant reproductiveness, its easy culture and adaptibility to apparently useless wastes, the simplicity of its preparation, and its value in the markets of the world, give it pre-eminence over many rivals. As a cordage material it is inferior only to Manila hemp.

Besides the sisal plantation near Ewa there are already several others in contemplation. The Kona Sugar Co. has about sixty acres devoted to this purpose, from which fibre of exceptional quality has been obtained; and many coffee growers are commencing to convert their land to the growth of sisal.

[4] Since the above was written Mr. B. F. Dillingham, of the Hawaiian Fibre Co., has issued a report which gives detailed statistics of the expenditure of the company since its inception in December, 1898. Exceptional importance attaches to this report as the company is the first of its kind in these Islands, and the results were achieved during the experimental stage of the industry and at a time of widespread commercial depression throughout the Territory. The report will remain an important guide to future sisal planters, and marks a distinct advance in the development of Hawaii. Mr. Dillingham shows in brief that sisal fibre has been grown at a total cost of $98 per ton, which sold for $150 to $160 per ton. He also affirms that the experience already gained will enable a great economy to be at once practiced on all items of expenditure, and that the cost of production will be reduced to not more than $74 per ton.

SUNFLOWER.

EXOGEN. BAST FIBRE. *Compositæ. Helianthus annuus.*

The Sunflower is a robust annual, indigenous to the western states of North America, sometimes attaining in cultivation a height of twelve feet. The plant is valued in many countries chiefly for its oil, and is grown extensively in Russia and Germany. Many attempts have been made to grow the sunflower as a fibre plant, but little is recorded of the result of the undertakings, probably on account of their non-success. Specimens of fibre prepared at the Museum from plants cultivated for flower, were found to vary exceedingly. Taken as a whole they were white, thick, coarse and strong. In this last quality a wide divergence was noticeable, some specimens being extremely tenacious and capable of sustaining considerable torsion, and others remarkably brittle. This variation was probably due to the different ages of the plant, which before the production of the seed yields a tougher and more pliant filament, some samples even exceeding sisal fibre in strength.

The products of the sunflower are varied. Its oil has obtained a reputation in the manufacture of soap, although its value for painting, lubricating and table use is exaggerated. Its seeds are an excellent food for poultry, and make splendid oil cake for cattle. Bees are eagerly attracted by its flowers, which yield a pleasing honey, and its fibre is well suited for cordage and paper. Although it does not promise to ever take a prominent place among fibre-producing plants, its growth would probably be remunerative in small quantities when allied with the raising of bees and poultry. This plant yields its products in a few months and is well suited for producing rapid vegetation upon undesirable swampy land.

In conclusion, it appears well proved that the majority of useful fibre-yielding plants may be grown in Hawaii, but not with equal success from a pecuniary standpoint. With its advantages of climate this Territory is able to select its vegetable products in a way possible to few other countries, and the inferior and less remunerative class may thus be ignored. As with most other industries, however, the absence of cheap labor offers great obstacles to the production of those fibres depending chiefly upon manual preparation. The fibres which will be most successful in Hawaii

under the present conditions are therefore those of high value commercially for which perfected machinery is already procurable. Although the number of such is very restricted their cultivation in these Islands is full of promise.

Among the best quality of fibres adapted to Hawaii, ramie and oloná rank high, but the machinery for their preparation is not yet available, and their manufacture in large quantity is in consequence impracticable; they may, however, in a few years find a place among our exports when their quality will find them a ready market. It is well to remember that ramie grows readily in many parts of the globe and is already planted extensively in S. Europe where better machinery only is needed to develop the industry: in this respect ramie does not appear to entirely fulfil the requisites of a successful Hawaiian product.

To immediate planters, the fibre most worth attention is sisal, the cultivation of which has already established itself among the lucrative enterprises of these Islands; but although the present market value is high, it seems unlikely that this will continue indefinitely, as large areas are now being devoted to sisal in California and elsewhere, and Hawaiian fibre may have eventually to seek a more distant market. At present there appears no prospect of over-production of this article, but this contingency will probably arise in the future. It is satisfactory to know that Hawaiian sisal is superior to any other. Planters of this fibre would do well to experiment with sanseveiria and perhaps pita, the general cultivation and manufacture of which are similar to sisal, and the same machinery well adapted to all three. Of these sanseveiria is in some respects superior, sisal appearing in general value to hold a middle place.

Pineapple fibre grows readily in Hawaii and is now receiving some attention. It is one of the most valuable fabric materials, and the areas suited to its growth are more limited than those of many others. The general cultivation and process of manufacture are somewhat similar to those of sisal, and piña appears to fulfil most of the conditions necessary for successful introduction to Hawaii.

As the best substitute for true hemp and the most valuable cordage fibre, Manila hemp should also have an assured future in Hawaii. It grows readily in these Islands and has preponderating qualities over sisal, but the absence of satisfactory machinery at

the present time gives the latter the advantage. Much improvement is hoped to be made in this direction, when it is quite possible that abaca fibre will be grown in Hawaii to the exclusion of all other cordage materials.

A great stimulus should take place during the next few years to the production of fibre in Hawaii, which with allied industries may eventually rank in value as the second commercial resource of the Territory. Among the enterprises of the future the growth of abaca and piña fibres, together with a great development of sisal production, the establishment of a cordage and sacking factory to supply with home-grown and manufactured products the enormous demand of the sugar and other industries, and of a paper mill to utilize the waste of the fibre mills, will assuredly hold an important place.

The following table represents the comparative strength of the various fibres prepared and tested for this paper, ramie being taken as the standard of tenacity:

Ramie (supplied by Dr. Nicholas Russel)	1.00
Oloná	.84
Pineapple (not Hawaiian-grown)	.78
New Zealand Flax (not Hawaiian-grown)	.60
Manila (Philippine fibre)	.57
Bow-string Hemp	.49
Sisal	.48
Pita	.45
Cotton Bast	.37
Jute (not Hawaiian-grown)	.36
Sunflower	.35
Coir	.34
Rosella	.30
Hau	.29
Okra	.21

The writer acknowledges with thanks the assistance of Professor William T. Brigham, Dr. Nicholas Russel, Messrs. A. F. Cooke, F. G. Krauss and A. H. Turner, who contributed material for experiment and furnished various data. The following works have been consulted: The Cyclopedia of India (Balfour), The Dictionary of the Economic Products of India (Watt), The Useful Fibre Plants of the World (Dodge), Uncultivated Bast Fibres (Dodge), Tropical Fibres (Squier), La Ramie (Michotte), The Inhabitants of the Philippines (Sawyer), Index Kewensis (Fowler and Jackson), The Leaf Fibres of the United States, and other reports of the Fibre Investigations of the U. S. Department of Agriculture.

Distribution and Variation of Achatinella multizonata from Nuuanu Valley.

C. MONTAGUE COOKE JR., PH.D.

SINCE October of last year the writer has been engaged in making a systematic collection of Hawaiian land shells for the Bernice Pauahi Bishop Museum of Honolulu. There is no systematic collection of these shells in any museum, with the exception of Mr. Gulick's collection now in the Boston Society of Natural History. This Society also has the largest collection in point of numbers. The British Museum has a large collection and a very valuable one. It contains about two-thirds of the type-specimens.

There are several valuable private collections which have been carefully made and are systematic in arrangement. It would be a great loss if any of these collections are ever allowed to leave the Islands, as each contains peculiar local and color varieties which could never be replaced, as the districts from which these shells have been collected are now barren of shells, due to the destruction of the forests.

There is almost nothing known of the habits of the Achatinellidæ. They are undoubtedly nocturnal. During a rain a few may be found with the animal extended; but less than three per cent. have been thus found. The arboreal forms are usually found on the leaves of trees and shrubs. A few may be found on the branches or trunk, while only a very few occur on grass and ferns at the base of the trunk. Nothing is known about their food. It is not known whether they have a breeding season or not. Some specimens may be found pregnant no matter at what time of the year the shells have been collected. No data have been published showing a larger per cent. pregnant during any particular season.

All the Achatinellidæ are hermaphroditic and most of the genera are viviparous. The arboreal forms, when pregnant, usu-

ally contain a single young. A few cases have been found by the writer in which a uterus has contained two young. In this case the young are at different stages of development. In the terrestrial forms, when a specimen is pregnant, there are usually from three to five young. These are always in different stages of development. In one case the writer found eleven young in the uterus of an *Achatinella* (*Laminella*) *gravida*.

The collecting thus far has been confined almost entirely to Nuuanu valley. About 3000 shells have been collected from the north-western side of this valley. Of these shells 1785 belong to Mr. D. D. Baldwin's *Achatinella multizonata*. Nuuanu valley has a north-easterly trend. The sides are more or less precipitous and rise from a few hundred to more than two thousand feet above the bed of the valley. The sides are covered by a low dense mass of trees, shrubs, ferns and creepers. Extending into the valley, at about right angles to the sides, are numerous sub-ridges. The upper portions of these sub-ridges and of the valleys between them are also overgrown with a dense mass of vegetation. The lower portions and also the bed of the main valley are covered with the introduced "Hilo grass" (*Paspalum conjugatum*) with here and there clumps or isolated individuals of Lehua (*Metrosideros polymorpha*), Straussia, Guava (*Psidium guayava*), etc. There are about twenty-three of these sub-ridges, which are more or less parallel to one another. In some cases the foot of a sub-ridge expands into a more or less undulating slope. In numbering these sub-ridges the numbers begin at the head of the valley.

A. multizonata is found on all the upper 17 sub-ridges, a district of about a mile in length, and from 100 to 400 yards in breadth. There are no permanent streams in any of the valleys between these sub-ridges. Two of these valleys usually have a little flowing water. The valley between sub-ridges XIV and XV serves as a boundary to several of the color-varieties. That between XVII and XVIII serves as a boundary to the whole species. In some cases a sub-ridge has been divided into two or more localities. This has been done when there has been a group of trees isolated from the rest of the trees growing on the sub-ridge. These localities are designated by adding a letter to the number of the sub-ridge. None of the localities are more than 150 yards in diameter. *A. multizonata* is found in more or less open localities. Specimens are

seldom found where there is a dense vegetation, the limit being at the thick growths of the "Stag-horn fern" (*Gleichenia dichotoma*) and Ieie (*Freycinetia Arnotti*). The elevation at which it is found is from about 1000 ft. to about 1400 ft. Of the shells found 95.5 per cent. were on either lehua, straussia or guava. Lehua represents 53.3 per cent. of the trees on which shells were found, straussia 9.8 per cent., and guava 29.8 per cent. Of *A. multizonata* 54.6 per cent. were found on lehua, 14.2 per cent. on straussia, and 26.7 per cent. guava. Of the remaining plants *Pæderia fœtida*, representing 1.7 per cent., yielded 1.2 per cent. of the shells; *Kadua*, representing 2.3 per cent., yielded 1.2 per cent.; and all others, about a half a dozen genera, representing 3.1 per cent., yielded 2.1 per cent. The distribution of these plants, according to sub-ridges, and of the color-varieties found on these plants may be found in Tables II and III.

Achatinella multizonata Baldwin.[1]

"Shell dextral, imperforate, moderately solid, elongately conical, apex sub-acute, surface shining, striated with fine lines of growth, under a strong lens showing very numerous, extremely minute decussating striæ; apical whorls smooth, scarcely decussated. Color white, variously striped with numerous dark brown lines and bands, some on the base and others spiral. Whorls 6, lightly marginate above, convex; suture lightly impressed. Aperture oblique, oval, white, the dark bands of the exterior visible within; peristome acute, thickened within, slightly expanded, white, the dark lines of the exterior marked on the inner edge; columella purplish brown, terminating in a strong, oblique, tortuous fold. Length, 18; diam., 10 mm. Habitat, Nuuanu valley, Oahu. Animal when extended in motion, longer than the shell. Mantle brown, lighter on the outer edge. Foot above and below light brown, posterior portion tapering. Tentacles long and slender; these, with the head above, slate color."

The above is Mr. Baldwin's description of *A. multizonata*. Mr. Baldwin states that the mantle is brown. In all the specimens collected by the writer the mantle varies from a very dark to a light slate color. It is sometimes mottled with light or dark markings. *A. multizonata*, in common with most of the arboreal achatinellidæ,

[1] Proceedings of the Academy of Natural Sciences of Philadelphia, pp. 215, 216, pl. x, f. 1, 2. 1895.

varies greatly not only in color but also, in a less degree, in size and form. Mr. Baldwin states in a note that "a great variety of transition forms occur between this species and *A. bellula* Smith, which is found on the neighboring mountain ridges of Nuuanu valley, and is a much larger shell." *A. bellula* is not only larger, but the shell is more solid and the median whorls less convex. *A. bellula* varies to a much less extent. *A. multizonata* varies from a pure white to a rich mahogany brown, and also through a larger number of striped variations. The apex of the shell also varies. In about half of the color-varieties the apex is white or a very light brown; the rest have the apex striped with a light to a very dark brown band. The color of the apex is nearly constant in each color-variety. In color-variety W, however, slightly more than half the shells have the apex white, the remaining having a banded apex.

Young, dissected from the uterus of the animal, usually agree in coloration, with the apex of their parent. Several exceptions have been found of shells with a white apex containing a striped young, while only four cases have been found of shells with a striped apex containing white young.

For convenience the writer has divided this shell into twenty-five color-varieties. Each of these color-varieties is designated by a letter. The letters thus used are A–T and V–Z. A very large number of intermediate specimens occur. Some of these color-varieties have a very restricted range, being found on only three or four of the sub-ridges; others are found over nearly the whole range of the species.

Color-variety A.

Shell white, sometimes light yellow near the edge of the peristome; columella white, sometimes purple; 117 specimens. This color-variety is distributed over nearly the whole range of the species. It is not found in localities XIVa and XIVb. About 70 per cent. of this color-variety were found on lehua, though this tree represents only about 53 per cent. of the plants on which shells were found. About 43 per cent. came from sub-ridges VII, VIII and X.

Color-variety B.

Shell white, with the suture marked with a brown band or line; columella white-purple; in the latter case the umbilical re-

gion dark brown or black; 20 specimens. In this color-variety it is interesting to note that the specimens were collected only at the extreme limits of the range of the species; 4 specimens were found on sub-ridges I–IV, and 16 specimens from sub-ridges XV–XVII.

Color-variety C.

Shell white, sometimes light yellow near the edge of the peristome, apex light brown, this brown sometimes extends to the second and third whorls; columella white, sometimes purple; 125 specimens. This color-variety is distributed over nearly the whole range of the species, about 20 per cent. coming from sub-ridge X. This color-variety is absent from sub-ridges I and II, and also from localities XIVa and XIVb.

Color-variety D.

Shell a light chocolate brown; columella white to purple; 23 specimens. About 83 per cent. come from sub-ridges III–V, and 56 per cent. were found on straussia. This plant represents only 14 per cent. of the plants on which shells were found.

Color-variety E.

Apex and upper whorls white, the two lower whorls yellow; columella white to purple; 49 specimens. This color-variety is fairly distributed in small numbers over most of the range of the species.

Color-variety F.

Apex white to light brown, spire white encircled with bands or lines of light yellow which continue on the upper portion of the lowest whorl, base yellow; columella white to purple. In two specimens the suture is marked with a brown band. These two shells had the umbilical region dark brown, with the columella and peristome purple; 102 specimens. This color-variety is distributed over nearly the whole range of the species.

Color-variety G.

Apex and spire white, base yellow; columella white to purple; 192 specimens. This abundant color-variety is distributed over

nearly the whole range of the species. About 64 per cent. were found on lehua.

Color-variety H.

Apex and spire white, base a dark reddish brown; columella white to purple; 31 specimens. This color-variety is only found on sub-ridges XII–XIV, about 84 per cent. coming from the different localities on the lowest sub-ridges. This color-variety was found only on lehua and guava.

Color-variety I.

Apex white to light brown, spire white encircled by bands or lines of light yellow, the lowest whorl yellow encircled at the periphery with a dark brown band or two brown lines; columella light-dark purple rarely white, peristome usually purple, umbilical region sometimes dark brown; 66 specimens. This color-variety distributed from sub-ridge II–XIV, nearly 50 per cent. coming from sub-ridges X-XII.

Color-variety J.

Apex light brown, median whorls white, base of lowest whorl a rich reddish brown bounded at the periphery by a dark brown band or two lines; columella purple; 21 specimens. This color-variety was not found above sub-ridge VI, nor below sub-ridge XIV. Its distribution is somewhat similar to that of color-variety H.

Color-variety K.

Shell white, a dark brown band or two lines encircles the base at the periphery; the band is sometimes continued on the spire just under the suture; columella purple, rarely white; 127 specimens. This color-variety is distributed from sub-ridge I–XIV.

Color-variety L.

Apex and spire white, a dark brown band or two lines encircles the base at the periphery, the base below this band yellow; columella purple, rarely white; 111 specimens. The distribution of this color-variety is from sub-ridges I–XIV.

Color-variety M.

Shell a light brown, slightly darker at the apex, the base encircled at the periphery by a dark brown band; 13 specimens.

This color variety is not found below sub-ridge XIII; about 60 per cent. came from sub-ridges II–V.

Color-variety N.

Apex white to light brown; upper portion of the spire white, the lowest whorl encircled by two broad brown bands, one just above, the other just below the periphery; these bands separated by a narrow to broad white band at the periphery; the upper band continues for another whorl, encircling the spire just above the suture; the lower band sometimes represented by two–four brown lines. In four cases the outer edges of the two bands are margined with a very dark brown line; base white or yellow; columella purple; 37 specimens. This color-variety is easily recognized; it is confined to sub-ridges III–V. There are no intergrading forms between this color-variety and any of the other color-varieties.

Color-variety O.

Shell white, apex striped with a chestnut band, spire striped with two–eight light brown lines which continue on the upper portion of the last whorl; base reddish brown, striped with one–four dark brown bands or lines; suture marked with a brown band; columella purple; 56 specimens. This color-variety is almost confined to sub-ridge XIV, only four specimens coming from other sub-ridges; just half the specimens coming from the locality XIVc; 50 per cent. were found on guava.

Color-variety P.

Shell yellow, apex striped as in O; spire striped with two–eight brown lines which continue on the upper portion of the last whorl; base striped two–four dark brown bands or lines; suture marked with a brown band; columella purple; 50 specimens. Of this color-variety 80 per cent. came from sub-ridge XIV; 74 per cent. were found on guava.

Color-variety Q.

Shell white, apex striped as in O, the rest of the shell striped as in O; base white-yellow; columella purple; 326 specimens. This color-variety agrees closely with the specimens described and

figured by Mr. Baldwin. It is distributed over nearly the whole range of the species. It is absent, however, from sub-ridges X and XI. This is the most abundant of all the color-varieties.

Color-variety R.

Shell white, striped with three bands; a very dark brown band encircles the base just below the periphery; a light brown band encircles the periphery, and a dark brown band or line midway between the periphery and the suture encircles the last whorl and is continued on the spire; apex white to light brown; base white to yellow. In two cases the last three whorls are yellow. Suture sometimes marked with a brown line; columella purple, rarely white; 152 specimens. This color-variety is found on most of the sub-ridges above and including sub-ridge XIV. Only a single specimen was found below sub-ridge XIV.

Color-variety S.

Shell white, apex and spire white, base just below the periphery encircled by a dark brown band; a light brown band encircles the shell at the periphery; base white to yellow; columella purple; 45 specimens. This color-variety is closely related to R; it lacks, however, the dark brown line encircling the spire. It is distributed on most of the sub-ridges from V to XIV.

Color-variety T.

Shell white, striped with a fine light brown line on the spire; apex white; base white or yellowish, striped with two–four light brown lines; columella white, rarely purple; 9 specimens. This color-variety is widely scattered from sub-ridges III–XIV.

Color-variety V.

Shell a light pinkish purple, apex banded as in O; lowest whorl and spire striped with yellowish bands or lines; base yellowish. In one case the lowest whorl and spire striped with dark brown lines; columella purple; 6 specimens. Of this color-variety 2 specimens came from sub-ridge XIII, 3 from sub-ridge XVI, and 1 from sub-ridge XVII. All were found upon lehua.

Color-variety W.

Shell a rich mahogany brown; apex in most cases white, in other cases striped as in O; in the latter cases the suture is marked with a dark brown line; columella purple; 18 specimens. This color-variety is confined to the last two sub-ridges. All the specimens except three were found on lehua.

Color-variety X.

Shell a rich mahogany brown, as in W, but striped with numerous dark brown lines; apex banded as in O; suture marked with a dark brown line; columella purple; 15 specimens. This color-variety was found only on sub-ridges XV–XVII. All were found on lehua.

Color-variety Y.

Apex white, base a dark brown shading into a pinkish purple near the suture; this lighter color is continued on the spire; columella purple; a single specimen. This specimen came from sub-ridge XVII. It was found upon lehua.

Color-variety Z.

Shells variously colored or striped; apex striped with a dark brown band; the lower whorls are marked as in B, E and R; suture marked with a brown line; columella purple; 73 specimens. In this color-variety there has been considerable "lumping". All the specimens agree in having the apex striped with a very dark band. In all cases this has occurred in color-varieties which usually have a white or light brown apex. This color-variety is almost confined to sub-ridges I and II. There are only three exceptions out of 73 specimens; these came from sub-ridges III, VII and XI. Of this color-variety 70 per cent. were found upon guava.

These color-varieties fall naturally into seven groups. The first of these groups, and also the largest, is made up of the color-varieties A–H. It is easily recognized, as none of the shells are marked with dark bands or lines. The shells vary from white to yellow. The apex is white to light brown; never striped. The columella is usually white, sometimes purple. This group represents about

37 per cent. of *A. multizonata.* Of this group 63 per cent. were found on lehua, about 16 per cent. on straussia, and 17 per cent. on guava.

The second of these groups contains the color-varieties I–M. The shells are white to yellow, sometimes marked with brown. All the shells of this group are encircled at the periphery by a dark brown band, or two brown lines. The apex in every case is white or light brown. The columella is usually purple, almost never white. This group is only found from sub-ridges I–XIV. It contains nearly 19 per cent. of the specimens of *A. multizonata.* Of this group 53 per cent. were found upon lehua, 15 per cent. on straussia, and 24 per cent. on guava; 48 per cent. of this group were found on sub-ridges IX–XIII.

The third of these groups contains the color-variety N. This color-variety is so distinct from all the other color-varieties that it is thought best to place it in a group by itself. All the specimens came from sub-ridges III–V, 62 per cent. coming from sub-ridge IV. About 40 per cent. were found on lehua, 21 per cent. on straussia, and 27 per cent. on guava.

The fourth group contains the color-varieties O–Q. This group is distributed over nearly the whole range of the species. It is absent, however, from sub-ridges IX–XI. The shells of this group are striped with from four to fifteen lines or bands. The apex is striped with a light brown band. The columella is usually purple; in only a very few cases is the columella white. Of this group 48 per cent. came from sub-ridge XIV; 44 per cent. were found on lehua, 12 per cent. on straussia, and 43 per cent. on guava.

The fifth group is made up of color-varieties R–T. The shell is white, variously striped; the apex is white; columella is usually purple. About 60 per cent. were found on lehua, 15 per cent. on straussia, and 19 per cent. on guava. This group is distributed over nearly the whole range of the species; only five specimens were found below sub-ridge XIV.

The sixth group is made up of the color-varieties V–Y. The shells are variously colored from a rich mahogany brown to a pinkish purple. The apex is usually banded; in some cases it is white. The columella is usually purple. All except two specimens came from sub-ridges XV–XVII; 75 per cent. were found upon lehua.

This group comes nearest, in color, to *A. bellula* Smith, but differs in form and size from that species.

The seventh group is made up of the color-variety Z. This color-variety agrees with several of the other color-varieties in the markings of the lower whorls, but differs from them in the very dark banded apex. Of this group 96 per cent. were found on sub-ridges I and II; 70 per cent. were found on guava, and 23 per cent. on lehua.

The seventeen sub-ridges on which these shells were found may be divided into six districts, according to shells found on them. The first district comprises the sub-ridges I and II. The characteristic color-variety of this district is Z. This color-variety represents 72 per cent. of the shells from this district; 96 per cent. of this color-variety are from these two sub-ridges.

The second district comprises the sub-ridges III–V. The characteristic color-variety of this district is N. All the specimens of this color-variety were from this district.

The third district is made up of sub-ridges VI–VIII. Group five contains the characteristic shells of this district, from which 48 per cent. of this group came.

The fourth district is made up of the sub-ridges IX–XIII. The characteristic shells of this district are group two; 47 per cent. of this group were from this district.

The fifth district is made up of the sub-ridge XIV. The fifth group characterizes this district; 48 per cent. of this group are from this district. This group represents 64 per cent. of the shells from this district.

The sixth district is made up of sub-ridges XV–XVII. The sixth group contains the characteristic shells of this district. All but two specimens of this group were from this district.

There are seven of the color-varieties of which over 95 per cent. came from two or three consecutive ridges. These are: H, with 97 per cent. from sub-ridges XIII–XIV; J, with 95 per cent. from XII–XIV; N, with 100 per cent. from III–V; O, with 96 per cent. from XIII and XIV; W, with 100 per cent. from XVI–XVII; X, with 100 per cent. from XV–XVII; and Z, with 96 per

cent. from I and II. There are only two of the color-varieties found in like proportion on a single genus of plants. These are the color-varieties V and W, of which all the specimens were found on lehua.

The sixth group of color-varieties, as has been said, is very closely related to *A. bellula*. This group is represented by only 40 specimens, of which all but two came from sub-ridges XV–XVII. This group is connected with the three largest groups by the following color-varieties: H with the first group, J with the second group, and O with the fourth group. The third and fifth groups are most nearly related to the second group. The seventh group agrees in the color and markings of the last whorl with the first, second and fifth groups; and in the banded apex with the fourth group.

In this species it can be seen that isolation plays a greater part than environment.

In closing the writer wishes to express his thanks to Director William T. Brigham for naming several of the plants, on which shells were found, and for many useful suggestions. Also to Rev. E. W. Thwing for the loan of a valuable paper.

TABLE I.

SHOWING THE DISTRIBUTION OF THE COLOR-VARIETIES AND THE PERCENTAGE OF THE GROUPS OF COLOR-VARIETIES OF EACH SUB-RIDGE AND LOCALITY.

Sub-ridge.	A	B	C	D	E	F	G	H	Per cent.	I	J	K	L	M	Per cent.	N	Per cent.	O	P	Q	Per cent.	R	S	T	Per cent.	V	W	X	Y	Per cent.	Z	Per cent.	Total per Sub-ridge.
I	1	1	....	....	....	3	1	....	12	....	....	1	3	....	8	....	......	....	....	2	4	2	....	....	4	....	....	....	....	......	35	72	49
II	2	1	....	....	1	3	1	....	14	3	....	7	3	1	24	....	......	....	....	....	......	1	....	....	2	....	....	....	....	......	35	60	58
III	1	....	5	3	2	5	6	....	49	1	....	5	2	2	22	5	11	....	....	4	9	....	....	3	7	....	....	....	....	......	1	2	45
IV	6	2	4	11	2	4	11	....	42	3	....	9	8	1	22	23	24	....	1	7	9	1	....	2	3	....	....	....	....	......	....	......	95
V	3	....	8	5	....	11	8	....	43	2	....	4	8	4	22	9	11	....	....	3	4	14	2	....	20	....	....	....	....	......	....	......	81
VI	8	....	3	....	3	6	8	....	55	1	....	4	3	....	16	....	......	....	....	4	8	11	....	....	21	....	....	....	....	......	....	......	51
VIa	13	....	10	....	1	7	6	....	35	1	....	2	5	....	8	....	......	....	....	15	14	40	6	....	43	....	....	....	....	......	....	......	106
VIb	1	....	4	....	1	1	2	....	26	....	1	2	1	....	12	....	......	1	....	12	38	7	1	....	24	....	....	....	....	......	....	......	34
VII	20	....	21	....	....	4	5	....	53	3	....	8	....	1	13	....	......	....	....	10	10	15	7	....	23	....	....	....	....	......	1	1	95
VIII	10	....	5	....	....	5	2	....	40	1	....	8	3	....	22	....	......	....	....	10	18	10	1	....	20	....	....	....	....	......	....	......	55
IX	....	....	....	....	....	....	....	....	......	....	....	2	....	....	67	....	......	....	....	....	......	....	....	1	33	....	....	....	....	......	....	......	3
X	21	....	26	....	5	15	16	....	58	16	....	24	11	....	35	....	......	....	....	....	......	9	1	....	7	....	....	....	....	......	....	......	144
XI	....	....	....	....	1	1	11	....	52	1	2	2	3	....	32	....	......	....	....	....	......	....	3	....	12	....	....	....	....	......	1	4	25
XII	4	....	5	2	7	1	14	1	57	5	....	3	6	2	27	....	......	....	....	3	5	5	2	....	11	....	....	....	....	......	....	......	60
XIIa	1	....	6	....	4	4	15	....	28	10	3	19	17	....	46	....	......	1	1	5	7	13	7	....	19	....	....	....	....	......	....	......	106
XIII	....	....	3	....	3	4	14	3	53	....	....	3	5	1	17	....	......	....	....	8	16	3	1	1	10	2	....	....	....	4	....	......	51
XIIIa	4	....	4	....	....	3	2	....	48	1	....	2	....	....	11	....	......	1	....	9	37	1	....	....	4	....	....	....	....	......	....	......	27
XIIIb	1	....	2	....	1	2	15	1	43	5	3	5	11	1	49	....	......	1	....	2	6	1	....	....	2	....	....	....	....	......	....	......	51
XIVa	....	....	....	....	8	1	9	....	11	....	....	....	5	....	3	....	......	10	37	73	77	4	8	2	9	....	....	....	....	......	....	......	157
XIVb	....	....	....	....	....	2	2	5	20	2	1	....	....	....	7	....	......	10	2	19	71	....	1	....	2	....	....	....	....	......	....	......	44
XIV	5	....	3	1	2	4	10	2	28	11	5	16	15	....	48	....	......	4	1	5	10	9	5	....	14	....	....	....	....	......	....	......	98
XIVc	3	....	1	1	....	6	10	19	41	....	6	1	2	....	9	....	......	28	....	20	49	1	....	....	1	....	....	....	....	......	....	......	98
XV	....	1	....	....	....	....	1	....	5	....	....	....	....	....	......	....	......	....	....	38	88	....	....	....	......	....	....	3	....	7	....	......	43
XVI	6	7	14	....	3	3	15	....	42	....	....	....	....	....	......	....	......	....	2	44	40	1	....	....	1	3	12	5	....	17	....	......	115
XVII	7	8	1	....	5	7	8	....	38	....	....	....	....	....	......	....	......	....	6	33	42	4	....	....	4	1	6	7	1	16	....	......	94
Total.	117	20	125	23	49	102	192	31	36.9	66	21	127	111	13	18.9	37	2.1	56	50	326	24.2	152	45	9	11.6	6	18	15	1	2.2	73	4.1	....

TABLE II.

SHOWING THE DISTRIBUTION OF THE PLANTS OF EACH SUB-RIDGE OR LOCALITY.

Sub-ridge.	Lehua (Metrosideros polymorpha).	Straussia.	Guava (Psidium guayava).	Pæderia fœtida.	Kadua.	Other trees or plants.	Total trees per ridge.
I	6	......	5	......	1	......	12
II	4	......	14	......	......	3	21
III	4	2	3	......	3	1	13
IV	6	5	13	......	2	4	30
V	15	4	......	1	2	1	23
VI	12	5	......	1	......	......	18
VIa	23	......	......	......	1	......	24
VIb	9	1	......	1	2	2	15
VII	16	8	1	1	......	......	26
VIII	15	2	......	......	1	1	19
IX	2	......	......	......	......	......	2
X	25	1	1	......	......	......	27
XI	8	......	......	......	......	......	8
XII	25	2	1	1	......	1	30
XIIa	......	......	32	......	......	......	32
XIII	14	3	1	......	......	1	19
XIIIa	......	......	18	1	......	......	19
XIIIb	23	......	1	......	......	......	24
XIVa	......	1	34	3	......	......	38
XIVb	......	......	18	......	......	......	18
XIV	16	3	1	......	......	1	21
XIVc	14	......	9	......	......	......	23
XV	4	12	......	......	......	1	17
XVI	13	1	4	......	.....	......	18
XVII	25	1	......	......	......	......	26
Total	279	51	156	9	12	16	523
Per cent	53.3	9.8	29.8	1.7	2.3	3.1	......

TABLE III.

SHOWING THE DISTRIBUTION OF COLOR-VARIETIES ACCORDING TO PLANTS.

Color-variety.	Lehua (Metrosideros polymorpha).	Straussia.	Guava (Psidium guayava).	Pæderia fœtida.	Kadua.	Other trees or plants.	
A	83	20	12	......	1	1	117
B	14	2	4	......	.....	......	20
C	76	31	15	1	1	1	125
D	7	13	2	......	......	1	23
E	27	4	17	......	......	1	49
F	64	13	20	......	3	2	102
G	124	25	35	3	1	4	192
H	21	......	10	......	......	......	31
I	37	6	17	2	......	4	66
J	15	1	5	......	......	......	21
K	62	24	32	......	4	5	127
L	60	16	27	3	......	5	111
M	7	4	1	......	......	1	13
N	15	8	10	......	3	1	37
O	27	1	28	......	......	......	56
P	10	......	37	3	......	......	50
Q	146	52	113	7	2	6	326
R	96	27	20	2	4	3	152
S	26	3	16	......	......	.....	45
T	3	1	3	......	1	1	9
V	6	......	......	......	......	......	6
W	15	1	2	......	......	......	18
X	15	......	......	......	......	......	15
Y	1	......	.....	......	......	......	1
Z	17	2	51	......	1	2	73
Total	974	254	477	21	21	38	......
Per cent.	54.6	14.2	26.7	1.2	1.2	2.1	......

A Monograph of Marcus Island.

By William Alanson Bryan, B.Sc.

PREFATORY NOTE.

The Trustees having been pleased to accept the offer of transportation tendered by Mr. W. C. Peacock in behalf of the Marcus Island Guano Company, authorized the writer, in the absence of the field collector, to undertake an expedition to Marcus Island in the interest of the Bishop Museum, to make a thorough investigation of the geology, zoology and botany of that remote island. The following paper contains the scientific results of the investigations made in the vicinity of and during a week's sojourn on the island. Owing to the presence of a party of Japanese, and the international complications resulting from both Japan and the United States claiming possession of the island, our stay was much more limited than had at first been planned. As a result, work on the marine zoology was curtailed to a considerable extent, and the collections made in all departments must be regarded as representative only. It has been thought advisable to restrict the present paper to the information gathered concerning Marcus Island, though much additional material was collected which will appear in the form of an account of our visit to Midway Island.

Grateful acknowledgments are due to the gentlemen interested in the commercial enterprise which made this expedition possible. Their never failing courtesy and generous assistance have done much to facilitate the work undertaken by this institution. In the proper connection I shall hope to acknowledge the kindly assistance of such distinguished specialists as Doctors Stejneger, Dall, Gilbert, Smith, Miss Rathbun and others to whom, as final authorities, I have referred various questions in nomenclature. Thanks are due Director Brigham for much assistance and kindly suggestions with the proof sheets; and to Mr. Sedgwick, who, as chemist of the Company, was my companion on the voyage, and who has added much to the accuracy and detail of the fol-

lowing account. I venture the hope that the present paper may be the first of a series of monographs which the Trustees may see fit to publish on some of the more interesting and as yet little known islands of this vast ocean.

INTRODUCTION.

Marcus Island, the subject of the present monograph, was so little known at a date as recent as 1900 that it could not be distinguished with certainty, either in location or characteristics, from a number of reported islands which are said to lie in that portion of the ocean, and since it was impossible to obtain definite information, however brief, concerning it, it seems but fitting to bring together here a history of the island so far as it can be gathered.

On a Mercator's projection map this mere speck of land rising above the ocean's surface is distant from Honolulu 2400 miles, and 4500 miles west by south from San Francisco, some 1200 miles southeast of Yokohama, and not less than 1000 miles from Guam, the nearest American soil. A number of corrected readings taken by our vessel places the centre of the island in Lat. 24° 14′ N., and 154° E. Long. Los Jardines, the nearest islands which are not directly confused with Marcus Island, are placed on certain maps and charts 200 miles to the southwest with their position indicated as doubtful; however, as they are described as being two small islands which were discovered in 1788 by Captain Marshall, and have been reported at rare intervals since by whalers, they need not here be taken farther into account. As to who named Marcus Island and for whom it was named the records at hand give no clue; doubtless its discovery, early history and naming are lost in the maze of uncertain and oftimes unreliable log books kept by those hardy seamen who made long voyages in these waters while engaged in the whaling industry.

Turning to the Directory of the North Pacific Ocean, published in 1886, I find that "Marcus Island has been shown as a doubtful island in Lat. 24° 25′ N., and Long. 153° 45′ E; but several other announcements of islands are found hereabouts. *Island* from whalers report, in Lat. 24° N., 150° 40′ E. *Another island* in 24° 5′ N., 150° 10′ E. It was seen by Captain Kilton in the *David Hoadley* in May, 1868. He describes it as a low, level, sandy island covered with trees and bushes, about two or three miles long east

and west. No breakers were visible, extending any great distance, from either end; its width was not ascertained. The position of the west end, by set of sights, was 24° 24′ N., 153° 58′ E., or twenty miles northward of the reported position of Weeks Island."

The U. S. Survey Ship Tuscarora, which made cable soundings across the Pacific in 1874, to which I will subseqently allude, came close enough to the island to observe large black rocks on the reef which fringed the shore. Commander Belknap states that the island is about sixty feet high and appears when first seen like a forest of trees rising out of the water. He placed it in Lat. 24° 14′ N., Long. 154° 0′ E., which agrees exactly with observations taken by our party.

Weeks Island, not unlike many others hereabouts, was originally a whaler's report, and by some is believed to be identical with Marcus Island. However, it was later seen by Captain Gelett of the Hawaiian Mission Ship Morning Star, and was located by him in 24° 4′ N., and 154° 2′ E. He states that it was about five miles long, densely covered with trees and shrubbery, with a white sandy beach, and a knoll near the centre rising about 200 feet above the sea. He saw no signs of inhabitants, and noted that a reef extended to the north of it.[1]

In an attempt to harmonize these varied and scattering reported islands and reefs, all of which have been more or less confounded with Marcus Island, one should not lose sight of the fact that they were made mainly in the days of long sailing voyages, when slight errors in the variation of the chronometer would tend to throw out the longitude, to which strong and variable currents add another element of uncertainty. In addition to which, since Marcus Island is not far from a centre of volcanic activity, disturbances of this character may have removed some reefs or islets below the surface of the sea; yet my observations of the flight of certain birds while in the vicinity of the island leads me to strongly believe in the existence of an island some fifty to seventy-five miles to the north and east of the island of Marcus.

[1] Still farther to the north are given: *Wake's Island* in Lat. 31° 14′ N., Long. 155° 0′ E. (A whaler's notice). *A Reef* in 31° 18′ N., 153° 20′ E. *An Island* in 31° 0′ N., 147° 16′ E. *A Reef* in 32° 0′ N., 147° 20′ E. *A Reef*, announced by the China Mail Steamer, in 31° 30′ N., 154° 0′ E. *Ganges Reef* in 30° 47 N., 154° 20′ E., and other reports which are doubtless repetitions or copies of one or the other of the above, making them too numerous to recount; however, suffice it to note that the Commanders of the Pacific Mail Steamers do not believe in their existence. *Congress Island* is given in 23° 30′ N., 148° 0′ E. *An Island* in 26° 6′ N., 154° 36′ E. Both located by whalers.

On the evening of the day previous to our sighting land, while we were something over a hundred miles to the north and east of it, all of the land birds observed took a uniform course off our starboard bow as they flew heavily laden on their return home from the day's fishing at sea. We held a course practically due west, and on the following noon sighted Marcus two points off our port bow. By knowing something of the radius to which certain of the birds observed go to sea, it did not seem improbable that the island (loc. cit., p. 1126) reported by the whaler as being in 26° 6′ N., 154° 36′ E. might yet be found to be a reality.

When the island was sighted from the masthead at about 7:30 on the morning of July 30, 1902, it resembled a low level cloud just discernible above the horizon. By 9 o'clock a rough outline was easily traced; an hour later a sandy beach and a few straggling coconuts rising above the forest line were seen; but nowhere, either at this time or subsequently, were we able to locate any elevation that could be mistaken for the sandy mound reported on Weeks Island. As we came closer to land breakers could be seen on the reef along the northwest side. A boat was lowered and manned. The Captain's party, including Mr. Sedgwick and the writer, took places in the stern, and then began one of the most exciting experiences of my life, for it was evident that we would have to make a landing over the reef, and the presence of numerous sharks about our boat made a setting for the undertaking which gave every promise of a real adventure. As we were rowed landward we could see the swells breaking into great sheets of spray on the jagged submerged walls of coral and shooting high into the air; but by following along the line of breakers we finally came to a place about a third of the distance from the southwest point where, by waiting a favorable opportunity, it was possible to get our boat through a narrow shallow opening in the reef, and to make our landing without mishap.

Finding certain officers of the Japanese Government in possession of what we had anticipated to be American territory, it might be well to explain that, remote as the island is from the two countries, both Governments had considered it of sufficient importance to lay claim to its sovereignty. The Japanese claim was based fundamentally on its accidental discovery by a shipwrecked captain, who had gone ashore on the island in a terrific storm. This event

brought the knowledge of it to the attention of the Japanese, and from time to time hunting and fishing vessels called there, and on all such visits found it entirely uninhabited. In 1896 these visits were made of a more or less permanent character, and since that

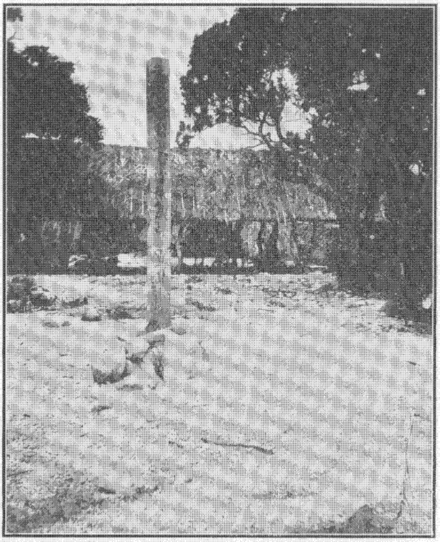


FIG. 1. Photographed from the beach in front of the settlement. Showing the wooden monument erected by the Government of Japan in 1898, which sets forth her claim to the island. The palm-thatched shed was used by the colony in preparing birds for fertilizer.

time Japanese have repaired to the island each year during the summer months and have established a thrifty colony. However, no official steps were taken by their Government to lay claim to the island until in July, 1898, when it was incorporated in the Bonin Group and officially named Minami Torishima (South Bird

Island). In that year a wooden monument (Fig. 1) which set forth Japan's claim was erected on the south beach.

On the other hand Captain Rosehill, a citizen of the United States, while engaged in trading in the Pacific, landed on the island in June, 1889, with a view of ascertaining its value as a coconut island, and believing himself to be the first person to set foot on its soil, or at least that it had never been taken or occupied by any Government or individual, he claimed it for the United States. Since that time he had been engaged in making a satisfactory proof of his claims and organizing the present expedition to investigate its guano deposits. Later, the Japanese Government (I understand) has relinquished all claims to the island and it may now be regarded as undisputed American territory.

Learning of Captain Rosehill's intended visit, the Japanese Government despatched a cruiser to the island and left a naval officer and a party of marines in control. It was owing to the military regulations imposed by them that the work of our party was so materially hampered, and that the period of our stay was made much too brief to accomplish as exhaustive an investigation as had been originally planned.

PHYSICAL FEATURES.

The geographical position of Marcus Island has been touched upon under a previous head; it therefore remains to consider its structure and physical features before attempting to draw conclusions concerning its geological history.

On approaching the island from the sea in a small boat, one is attracted by the intense blue of the ocean washing the growing reef on every side. The reef itself is of the common form fringing almost all coral islands of this class in the Pacific. Its outer face, though jagged and broken, seldom gives way to form a channel of sufficient width and depth to admit of a small boat passing through at low tide; in fact only two such places were found by our crew: one, the first point from which we effected a landing, about a third of the distance from the southwest point on the northwest side of the island; the other, about a quarter of the distance from the same point on the southern side. This latter, by no means a safe passage for a whale boat, is the principal opening and the one made use of by the Japanese in landing their supplies and shipping the fertilizer and bird skins secured by them. The time at my

disposal did not permit of making systematic soundings; nevertheless a number of attempts were made at various times to find anchorage for our schooner close in to land, with the result that

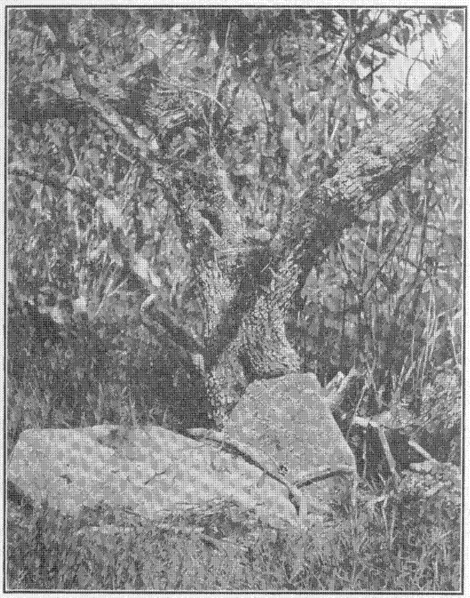


FIG. 2. Showing large flag rock of shingle conglomerate that has been broken loose from the water line and carried inland by the action of the sea. In the tree are three nests of the Noddy Tern, *Anous stolidus* (Linn.).

bottom was found at a depth of eight to fourteen fathoms on all sides of the island, within a few hundred yards of land. The bottom was of solid rock—probably coral—with occasional patches of sand and shingle. I believe that no vessel has found a satisfactory

anchorage, though the best is considered to be half a mile off land on the southern side in fourteen fathoms of water.

The set of the current in these waters is in a northwesterly direction, though the island forms a local current which is exceedingly variable and not to be relied upon when close in to the breakers. On the table reef, particularly along the northwest and eastern sides, are to be seen huge blocks of solid coral rocks rising ofttimes eight or ten feet above the water at low tide; many of these rocks weigh tons and the force required to disengage them from the growing reef and carry them landward cannot be estimated, though it should by no means be lost sight of in considering the forces used by nature in this interesting work of island building.

Scattered at irregular intervals all along the beach, and not infrequently inland quite a distance, were to be found concrete flag stone rocks (Fig. 2) that had been broken loose from where they were formed below the tide line and lifted high and dry on the beach in time of storms. Stones of shingle and sand, all of the most compact character, measuring three by five feet on the surface, and some six inches thick, were observed forty and fifty feet above the sea level and several hundred feet inland. When exposed to the wash of the ocean these conglomerate stones are invariably smoothly polished, and, being very compact and overgrown with nullipores, give very little indication of their composite character; however, when carried up on the beach and exposed to atmospheric agencies they tend to disintegrate and were always leached out and roughened, resembling an ordinary pudding stone in structure.

The reef varies considerably in width; it is a little more than a hundred yards in the narrowest place on the eastern side, while the average width is approximately two hundred yards. On the three main points the reef extends nearly seven hundred yards seaward. Being on the northern limits of the coral belt only the more hardy reef building *porites* and *pocillopora* are here to be commonly found. Perhaps a clear conception of the form of this bit of land, if indeed we can dignify a mere heap of sand and shells in the midst of the ocean by calling it land, can be had by holding in mind a roughly formed right-angle triangle, the chief angle of which would form the southwest point. By the ordinary action of

the sea the sides have become concave, while the angles have been rounded down to form obtuse points. Beginning with the south side we find the beach composed, for almost its entire length, of coarse coral shingle, from which the finer coral sand or detritus has been thoroughly sifted. The average size of the pebbles along

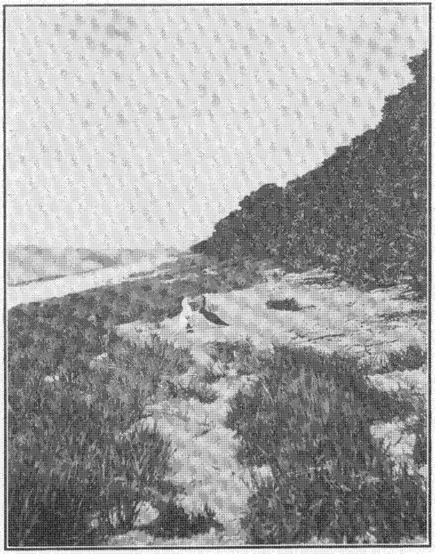


FIG. 3. The northwest side, looking toward the north point. The birds are the female and the downy young of the Booby, *Sula sula* (Linn.).

the water line was probably half an inch in diameter. Back some distance these bits of coral were considerably larger in size and were not so worn and rounded. Immediately in front of the settlement, between a salt water well and the sea, was exposed a table of shingle conglomerate, the surface of which was some fifteen feet or more above the sea.

The old exposed beach conglomerate was immediately back of the opening in the reef, and it was doubtless owing to the action of the waters that the loose superposed shingle, which was some four feet in depth over it, had been removed exposing this interesting bit of geological data. Everywhere along this beach was to be found evidence that the island was being added to at all times, and especially during storms. Stretching along the entire southern side was an apparently new beach. On inquiry I learned from the Japanese that in the month of October, 1901, there had been a heavy storm from the south that prevailed with much violence for ten days, during which the sea rose to a point they indicated to me that was fully twenty feet above the ordinary water line.[2] It was at the time of this storm that the new beach referred to was laid down; I estimated its width to be forty feet, with the greatest depth of twelve feet at about the middle of the southern shore. Back of this new deposit there were evidences of similar constructive storms in the not too distant past.

The northwest coast (Fig. 3) was made up largely of sand and small coral shingle, and the beach formed a less abrupt angle with the sea level than the one just considered, indicating that though it was not wholly free from storms they had been less frequent, and as a rule less violent in recent years. About a quarter of the distance from the northern point, and extending from there on to the northern end of the island, was exposed a black coral reef one hundred and fifty feet at the widest point, and sloping from the land to the sea; it is probably seven feet above the water line, where it disappears under the sand and shingle of the upper beach. The geological significance of this elevated reef is apparent. Its surface was sculptured into holes and ridges by the action of the water, while its structure was most compact and must have offered great resistance to ordinary weathering; some of the pits in the surface were large enough to hold several gallons of water.

The east and last side of the island to be considered shows the effect of many furious storms; indeed, it is all the industrious

[2] Since the preparation of the above article I have received a letter from Mr. Y. Nagata, a Japanese who was on the island during our visit. He states that on September 2, 1902 (a month after our departure), a storm of unusual violence broke on the island from a southerly direction, carrying away the rough houses, destroying many of the trees, and forcing the colonists to retreat to the highest point for safety. They were left without food other than fish and birds from that date until December 25. During this time sixteen of their number perished.

polyp can do to build its masonry of coral rock as fast as old ocean is pleased to here heap up the land-forming materials. Near the north end the land attains a height of seventy-five feet, which was the highest point found. In this vicinity the beach is made up of

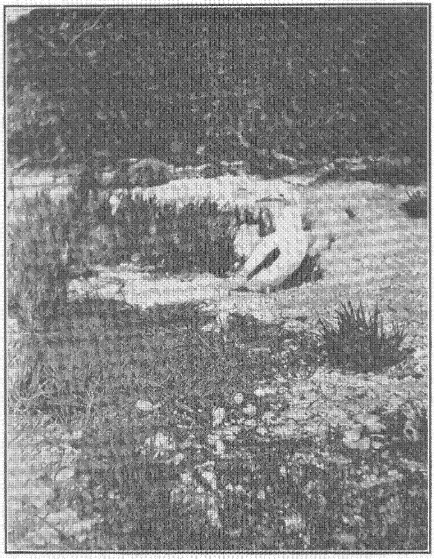


FIG. 4. One of the curious spaces inland on which, though surrounded by dense woods, no trees or shrubs will grow.

six successive bench-like steps. These mark the gradual receding beach lines and point unmistakably to successive elevations. The old benches are quite uniform in character, being twelve feet deep and thirty or forty feet in width. Rounded blocks of coral which go to make up the upper ones are often as large as a man's head. Intermingled with the stones are shingle and sand of a coral

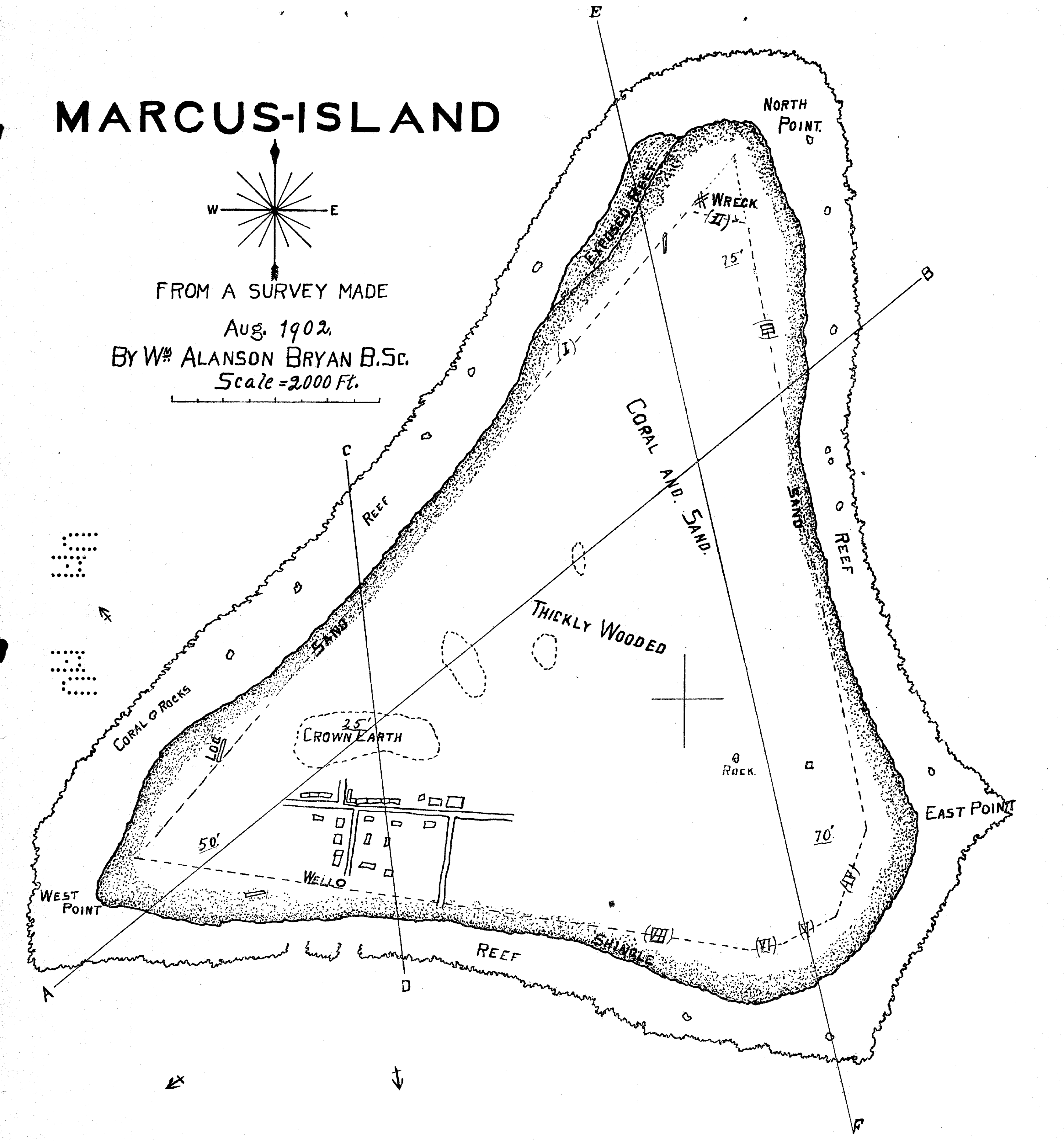
nature, but the grinding and sorting process of the waves is clearly seen; the larger and rougher materials remaining in the upper beaches, while shingle and coarse sand form the lower ones.

In the middle of the island along this side the highest point is not to exceed forty feet, while at the southeast point an elevation of sixty-five or seventy feet is attained. Turning to the interior of the island we found the surface to be, generally speaking, quite level, though the eastern half was broken up into minor surface irregularities. A little to the northwest of the centre were four separate deposits of loose black alluvial soil, which undoubtedly mark the location of as many dry lagoons.

Generally speaking the island has been built up about these spots as a centre. The surfaces of these old lagoons are lower than the surrounding land, but still are in the neighborhood of twenty feet above sea level.[3] The western and northwestern portion of the island is made up of sand more or less mixed with humus. The eastern and southeastern portion is composed of coarse blocks of coral, coral shingle, huge coral boulders, and a great quantity of coral branches the prongs of which are ofttimes scarcely broken. A hundred and fifty yards from the coast line on every side the whole surface of the island is heavily wooded, excepting that scattered about here and there are to be found irregular patches, from a few rods to a few acres in extent, which are entirely destitute of trees and shrubs (Fig. 4), for which the composition of the ground offers no solution.

The extent of the coast line is a little over four miles, while the area of the island (estimated) is about 740 acres. A somewhat hasty survey of the island was made, from which field data I was able to draw the map given on another page. The following table

[3] Mr. Sedgwick, in carrying on the investigations of the Guano Company, made a number of excavations in various parts of the island, but especially in the bottoms of these old lagoons, which were now overgrown with thick grass, shrubs and trees, over which towered fine coconuts of great age. In these depressions exist varying conditions in the under strata, though the surface is uniformly composed of alluvial deposits varying in thickness from eight to fourteen inches. Underneath this, in the coconut patch, were found coral sand and earth from six to ten inches, then a layer of coral sand with pebbles, and occasionally solid base-forming coral in a slab, under which was found broken coral. In the two other larger alluvial patches beneath the black earth was light clay-colored mud composed of fine particles of coral, and below this were larger pieces of coral as far down as the excavations were carried, which was from six to eight feet. The investigations of the Chemist were not nearly as complete or as conclusive as it had been planned to make them. A limited quantity of guano was found which gave a test of 70 per cent. phosphate of lime; but the great majority of the samples secured were not so flattering.


MARCUS-ISLAND
W
E
FROM A SURVEY MADE
Aug. 1902.
BY Wm. ALANSON BRYAN B.Sc.
Scale = 2000 Ft.
NORTH POINT
WRECK
EXPOSED REEF
75'
CORAL AND SAND
SAND
REEF
THICKLY WOODED
CORAL & ROCKS
LOG
25'
CROWN EARTH
ROCK.
EAST POINT
70'
50'
WELL
WEST POINT
SHINGLE
A
B
C
D
E
F
I
II
III
IV
V
VI
VII

of the coast meander lines were taken with a compass and chain and may be regarded as approximately correct. Starting about 1500 feet from the southwest point the readings would be as follows:

1.	NE. ½ N., Magnetic	6900 feet.
2.	E. by S., Magnetic	600 feet.
3.	S. ½ E., Magnetic	6000 feet.
4.	S. by W. ½ W., Magnetic	900 feet.
5.	SW. by W. ½, Magnetic	600 feet.
6.	W. by S., Magnetic	300 feet.
7.	W. by N., Magnetic	6000 feet.

CORRECTIONS.—Corrected bearing of line 3, ¾ of a point to the east. Corrected unmeasured portion of line 1 by adding 1500 ft.

On all sides of the island, usually well up from the water, was abundant driftwood and wreckage. Great logs of unknown origin, sometimes fifty feet in length, with broken branches and scarred trunks were common. But it was well toward the north point that a single great "Northwest" log had gone ashore and been driven a considerable distance inland. Applying a tape I found the log twelve and a half feet in length by forty-two inches in diameter. Both ends had been cut square, and into the butt end was driven a large wooden wedge. We regarded this bit of silent evidence as indicating the natural relation existing between the American continent and this all but lost island, and looked upon it as a forerunner of the ultimate annexation of Marcus by the United States, an event which since our visit has been fully recognized. To the naturalists the story of the voyage of this adventurous log, detailing its history from the time of its leaving its home at Puget Sound until at last, wind and current-driven across the Pacific, it reached its final resting place, high on this isolated spot, would indeed be interesting and instructive could it be accurately told.

GEOLOGY.

From the description of the physical features which has been given it may be gathered that the island is to be considered as an ancient triangular atoll which has been elevated above the sea. The chief reasons for so regarding it are, its proximity to regions of known volcanic disturbances, its old dry lagoons, the elevated table of coral rock exposed at the southern side as well as the more recent one at the northern end, the steps or bench-like beaches on the eastern side, the huge blocks of coral rocks scattered over the surface which are above the reach of the highest seas, in addition

to the size and condition of the coral boulders which make up a large part of its surface.

The difficulties encountered in examining the geology of the island were considerable. The density of the vegetation at times made it impossible to see to any distance, and at all times rendered locomotion very difficult; however, I crossed and recrossed the island a number of times in every direction, in addition to making a detailed examination of the appearance of the seaward slopes, and carefully noting and photographing every important point that might throw light on the island's past history.

Turning to soundings taken by the U. S. S. Tuscarora[4] across the Pacific in March, 1874, we find, beginning on the 160th Meridian, 350 miles to the east of Marcus Island, that bottom consisting of yellow mud was found at a depth of 3023 fathoms; at the 154th Meridian, in the vicinity of Marcus Island, the sounding instrument secured coral and lava at a depth of 1499 fathoms; while at the 152d Meridian the bottom was found to be composed of ooze at a depth of 3023 fathoms below the sea level. So that from east to west Marcus Island may be regarded as the summit of an elevation in the ocean's floor,[5] forming a peak or fold which approaches near enough to the surface to admit of its being used by the reef-building corals as a lodgment.

The region to the west and northwest is one noted for its volcanic activity; while Rota, an island north of Guam, according to Quoy and Gaimard, has coral rocks upon its hills, more than 600 feet above the sea. The islands to the north of it are as yet little known, but like Rota give evidence of change of levels; while our experience on the night on August 5th, hereafter mentioned, leads me strongly to suspect that Marcus Island is not by any means a fixed island, and may yet be still further elevated.

Having once accounted for the floor of the ocean approaching near enough the surface to admit of a coral growth, the next step is an easy one, for by well known laws of nature, reef-building corals always tend to grow outward from a central point. The old

[4] Soundings taken by the U. S. S. Tuscarora in the vicinity of Marcus Island:—

Degree:	160 E.	159 E.	158½ E.	158 E.	156 E.	154 E.	152½ E.	150 E.
Depth:	3023 ft.	2938 ft.	2042 ft.	2173 ft.	3273 ft.	1499 ft.	3023 ft.	3287 ft.
Bottom:	Yel'w mud.	Mud lava.	Corals.	Corals.	Ooze.	Cor'l lava.	Ooze.	Ooze.

[5] I regret that my efforts to secure information concerning the floor of the ocean to the north and south of the island from the various cable companies who have made soundings in these waters were unavailing; so that it yet remains to be ascertained whether Marcus Island is simply the summit of a single subterranean mountain or a peak of a range.

corals in the centre of the growth die from want of suitable food, and as a rule a simple lagoon surrounded by a ring of coral results. Through the action of the waves fragments of coral are detached from the outer edge of the reef and piled on its surface together with shells and other land-building materials. In the lagoon, which at this time must have been more or less cut off from the sea except in the periods of storms, there begins to form an ooze which is augmented by the decaying vegetable matter supplied from the hardy shore plants growing on the ring of new formed land about it.

Located as our embryo island is in the regions of the terrific monsoons that sweep over the west and northwest Pacific, it is not difficult to account for the frequent appearance of small fragments of pumice and other light volcanic products that, floating on the surface of the ocean, have eventually been carried over the ring of sand and shingle and deposited in the comparatively quiet water of the lagoon and there mingle with fragments of coral, bits of shell, and other forms of ocean debris which are brought thither from time to time.

We have no definite clue as to the time required to build up the land to the greatest height it can attain from the ordinary action of the sea; but from the character of its surface at the highest points, consisting as it does of boulders of coral twelve inches or more in diameter, which are mingled with smaller fragments, we are able to leave out of account the action of the wind that is so frequently a potent agent in building coral islands above the high water mark. Investigators have determined that the highest waves are but little more than a third the height of this island (75 feet), so that we must look elsewhere for the agencies that would build up this heap of sand and shingle to its present height. Perhaps the most apparent and convincing testimony would be derived from a study of the dry lagoons and the material which forms their floor. Mr. Sedgwick made excavations in all four of these, but especially in the larger central one which is designated on the map. Reviewing the conditions found there it would appear that at a time when the island had been piled up to the height of thirty or more feet, the ring of land, lagoon and all, had been of a sudden subject to a uniform uplift. Gradually this lake-like lagoon had evaporated or leached out through its porous bottom, leaving a deposit of black

alluvial earth. We may conclude that the first stage of formation must have been, geographically speaking, comparatively brief, judging from the shallow deposits here found. Looking elsewhere for confirmative evidence my attention was directed to the conditions existing in the salt water well. It had been sunk into a

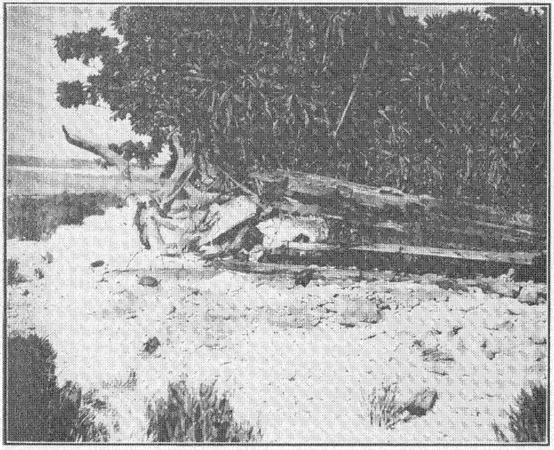


FIG. 5. View at north point, seventy feet above sea level. Showing the surface of the island at the highest point, the character of the foliage, and wreckage from a Japanese boat.

concrete of coral shingle for the last five feet, which had unmistakably been formed under water. Again, mention has been made of the exposed table of coral shingle rock which had been uncovered immediately in front of the settlement during the period of a recent storm. This rock, like that in the well, showed every evidence of having an aqueous origin, and the peculiar structure of the rock laid down by the action of the waves in shallow water. I conclude that this must have been an old shore line, most probably corresponding to the one first made when the lagoon was formed.

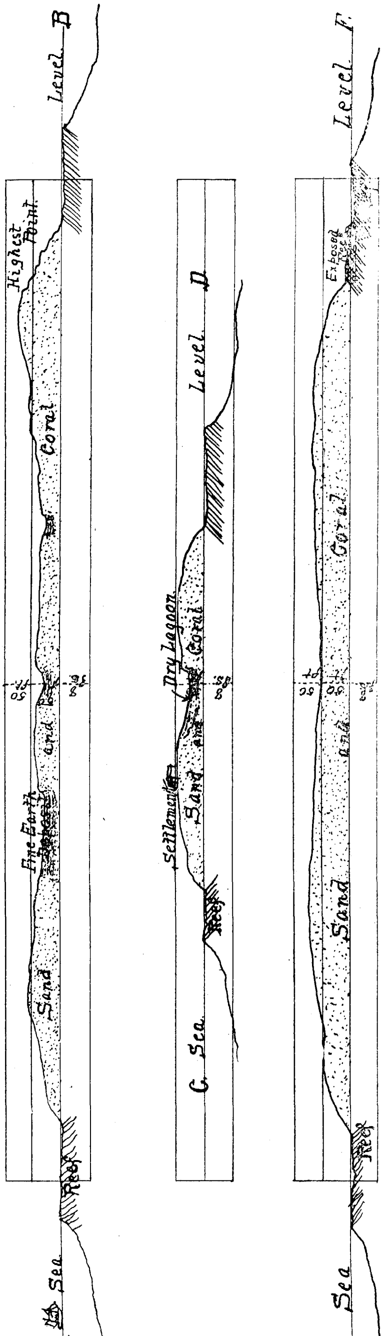


FIG. 6. Three vertical cross sections on the lines A B, C D, E F (See map); height in feet, depth in fathoms.

The condition existing at the north point (Fig. 5) was such as to leave no doubt in my mind that the reef here exposed had been formed and elevated at a period after the first described beach had been raised above the sea. Thus are we able to account for two successive elevations. The consequent change in the topography is perhaps best observed in the step or bench-like beaches, referred to above and delineated in cross section drawings A to B (Fig. 6), along the east coast. The uniformity of these beaches, taken in connection with the character of the material composing them, can only be accounted for by acceptance of a theory admitting of two or more periods of elevations in the island's history. It was interesting to observe that the northern and eastern portions of the land were most generally composed of the coarsest materials. No doubt this was due to the exposure of that side to the most extreme action of wind and sea, and the correspondingly narrow reef on that side; for, other conditions being equal, the relative size of the materials composing a beach is directly in proportion to the width of the surrounding reef. By consulting the map it will

be observed that the three points of the island are much higher than the middle of the three sides, which is due to the points being exposed to the building agencies from two directions. The same agencies of wind and tide which have formed the island have doubtless planted its coconuts, brought its vegetation and the land reptiles which inhabit it.

METEOROLOGICAL CONDITIONS.

The winds at Marcus Island in all probability vary but little from the prevailing winds in that part of the Pacific. It is well known that they are of sufficient force during the greater part of the year to cause the surf to break on all sides of the reef with great fury, rendering landing an exceedingly dangerous, if not impossible, feat during the seven months of the year from September until April. Throughout the remaining summer months the ordinary steady trade winds blow, and it is only at this season that landings can be made in safety.

We had no means of estimating the rainfall during the year, but the Japanese were able to catch enough water from the roofs in barrels, jars and boats to keep them well supplied with drinking water; and as they were especially careful to store all they possibly could I concluded that there were periods of drought. Aside from this source of supply there was no fresh water available save what little might be collected in the holes in the exposed reef at the north end of the island. There were frequent tropical rains during our stay that were considered by the residents as out of season. These caused the water to collect in the low places in the dry lagoons. When examined chemically it was found to be charged with phosphoric acid and organic matter to such an extent that it was pronounced unfit for drinking. The colony had supplemented the supply of water by digging a brackish water well fifteen feet deep back a little distance from the shore; this furnished water suitable for cooking and washing purposes only.

Thunder and lightning usually accompanied the storms. At times the electrical display was splendid, though disheartening to a naturalist. During a heavy rain on the night of August 5 there occurred what Mr. Sedgwick and myself both believed to have been a violent seismic disturbance. Though sleeping soundly the vibration caused us both to wake suddenly. We were so disturbed as to deem it advisable to make a light; on rising I felt it necessary

to hold to objects to maintain an equilibrium; so that the shock must have lasted some seconds.

The temperature varied but little in the few days on shore. By the thermometer the lowest temperature noted was 72° F., the highest 82° F.; but the heavy squally weather together with the steamy evaporation from the sand, rendered it almost intolerably hot and oppressive.

As a place of residence Marcus must be considered both healthy and habitable. In the six years that the island has been more or less regularly inhabited there has not been a single death, and no sickness that was attributable to the island or the climate.

AVES.

When in advance of setting forth on the expedition to Marcus Island we were commenting on its isolated position and anticipating the probable results of a general collecting trip thither, much hope was felt and expressed that there might be found on the island land birds which would be sufficiently different in habits or structure to throw needed light on the question of the probable source from whence certain land forms inhabiting the Hawaiian Islands had been derived. Consulting the meagre information available, I found the island reported as being five miles long, densely wooded, and rising 200 feet above the sea. Certainly a high island, well wooded and of considerable size—located where Marcus is, did seem to give promise of being a spot which might have served sea-blown land birds from the Marianas and Bonin groups as a stepping stone on their way to Laysan.

However productive of distribution figments the fancied field might have been, the reality was most disappointing. A painstaking search for land birds resulted in satisfying me that had any existing terrestrial or arboreal bird been in any way introduced on the island, it would have perished for want of suitable food. The island was little more than one-fifth the size I had expected; was less than one-third as high as reported, and, though densely wooded, the trees were of such species that no nectar-loving bird could have gained a livelihood from their blossoms; and certainly no insectivorous bird could have eked out an existence on the few small insects found; while the supply of fruits and edible seeds was all but *nil*. Nevertheless the absence of land birds was made up for, in numbers at least, by the abundance of certain sea and shore

birds. Fifty-six specimens were secured during the period spent on the island. These skins, taken in connection with very full notes made while in the field, form the basis of the following list. The measurements are given in English inches and hundredths. Where the length of a specimen is given, unless otherwise stated, the measurement was taken from the specimen in the flesh. The depth of bill is its vertical depth at the base. The colors of the soft parts were carefully noted, so far as possible Ridgeway's nomenclature of colors being used in their description.

Larus vegae (Palmèm.). **Pallas' Gull.**

I was so fortunate as to secure from the Japanese manager of the little colony of wing hunters a single specimen of this interesting species. My informant had resided on the island the greater part of six years, during which time he had secured specimens on four different occasions, but always in the winter months. The specimen before me was taken in March. The head and neck is whitish streaked with brown; the mantle is grayish brown, brown and whitish so mixed as to give a mottled appearance to the whole back and wings. The rump feathers and upper tail coverts are whitish with irregular brownish splotches and bars; the tail feathers are blackish or brownish with two fairly well defined white bands and whitish tips to all. The outer tail feathers are mottled brown and white throughout their length; the quills are umber brown, both shafts and webs, except the inner edge and tips which are whitish. The secondaries are also tipped with white; the breast is brownish mottled with whitish, while the crissum and under tail coverts are white occasionally spotted with brown. The legs are light colored in the skin, indicating flesh color in the living bird. The bill is blackish except for a space at the base of both the upper and the lower mandibles which is light colored. The measurements are: Length 25.50, wing 16.25, tail 6.55, tarsus 2.30, toe 2.50, culmen 2.10. I should judge the bird to be in the second winter plumage. To my knowledge the nearest previously published record of this species in the northwest Pacific is an example taken by Mr. Holst on Peel Island, of the Bonin group (See Ibis, 1890, 105), which is some 600 miles distant. My Japanese informant told me of another species, "smaller and with a blue back," which he had shot two years before. No specimen of it was obtained.

Sterna fuliginosa Gmel. **Sooty Tern.**

This tern is by far the most abundant bird on the island. They literally swarm over the reef, while on the sandy shore from almost the waters' edge to a considerable distance inland, especially under the trees, the ground was so covered with the old and young in all stages that one had to use great care to avoid stepping on them. During the day the noise made by this concourse was nerve-racking; but at night when the parents were all home from the sea and were in anxious search for their young, the cries of

FIG. 7. On the south beach looking east. The birds are principally the young of the Sooty Tern, *Sterna fuliginosa* Gmel.

Wide-awake, wide-awake, together with the scolding, angry *K-r-a-a* was almost distracting. It would be useless to attempt to estimate the number of individuals on the island; probably to say that there were hundreds of thousands would convey a conservative suggestion as to their abundance.

In certain centres of fashion there exists a great demand for the skins and wings of this particular tern; they are made use of in producing some of the wonderful creations of the milliner's art. As a result of this demand the enterprising, though destructive, colony of Japanese, previously referred to, had been established on the island to kill birds and prepare their skins for export to New York, Paris and Berlin, by way of the home office in Japan. While we were there some thirty men were engaged in the work. Certain

members of the party did nothing but catch and kill the birds for the especially trained taxidermists to skin. The bird-catchers did their work for the most part early in the morning or during the evening hours. This enabled them to select fine adult specimens that were at sea fishing during the day. Their equipment consisted simply of a bambu pole, or occasionally a net on a long pole, and a large light basket. One man in two hours will kill a basket full of birds. In one of these baskets I counted seventy-five perfect specimens. The skinning is accomplished at an astonishingly rapid rate. One man, they assured me, held the world's record for making bird skins, having made in one day of ten hours, under test conditions, one hundred and thirty complete skins. In such undertakings quantity, not quality, is the thing chiefly considered. As a result, few indeed were the skins that would have been received in a museum collection. The average day's work fell far below this record pace; probably the usual number would not exceed fifty skins. Still, during the six months from March to September not less than fifty thousand birds are there slaughtered as a sacrifice to the cruel goddess of fashion.

The birds were in all stages of development, from the downy nestling, just showing a few pin feathers, to the young of the year which were able to go to sea and secure their own food. The chicks, when very young, are streaked with brownish gray and dull white on the back, while below they are a uniform whitish color. This down soon begins to give way to the pin feathers which follow the down capsules as a continuation of the same shafts. The feathers appear over the back and wings first, followed by the feathers on the lower parts. In the meantime the wing quills and rectrices have partially developed; the head is the last to feather. Often the down remains about the base of the beak until the bird is able to fly short distances.

The parent birds here, as elsewhere, make no attempt at building a nest. Since they prefer to sit on the sandy shore, and on hot days to retreat a little farther inland under the shade of the trees, they deposit their single egg any place they happen to be at nesting time. Though they rarely go farther than three or four hundred yards inland, their young and eggs are to be found occupying almost every square yard of this Sooty Tern belt, which runs on the upper beach practically the entire distance around the island.

I never saw one alight in a tree; they are always found roosting on the ground, where they nest. From the Japanese I understood that a few birds remain on the island throughout the year.

Their food is made up entirely of the small surface-swimming fish; for these they can go as far as three or four hundred miles out to sea and return the same night to roost. On several occasions as we were nearing the island we would see small parties of terns on their homeward journey. Not infrequently a pair of old birds would be accompanied by their brown-bodied young. The inexperienced birds sighting our ship and regarding it as a suitable place to alight and rest would fly straight for the vessel, whereupon the parents would set up a cry of *K-r-a-a*, *k-r-a-a*, whereat the young birds, obedient to the warning, would change the course and submissively follow the parent birds on out of sight in the distance.

In August many of the old birds were moulting. During this period they seem to behave not unlike our cage canaries—sit about dejected, and appear to take little interest in things, indeed hardly moving out of the way as one walked through the brood. With this species the feathers seem to come off more or less in patches, usually first about the head. From the series secured I have selected and measured two adults and two immature birds which will show the comparative size of the young when able to shift for themselves.

No.	*Sex.*	*Length.*	*Wing.*	*Tail.*	*Tarsus.*	*Toe.*	*Culmen.*	*D. of B.*
2083	♀	15.50	12.00	5.25	.90	1.00	1.75	.45
2082	♂	15.70	11.70	5.20	.85	1.00	1.75	.45
2084	Im.	13.75	11.25	4.50	.90	1.00	1.35	.35
2086	Im.	14.25	10.25	5.00	.90	1.00	1.40	.35

REMARKS.—Bill and feet of immature birds reddish brown.

Judging from the stage of advancement attained by the brood in August the eggs must have been deposited in May or early in June.

It is worthy of record that on examining the thousands of tern skins which the Japanese had prepared I could not find one of the Gray-backed Tern (*Sterna lunata*). None of the Japanese had ever seen a tern with a blue-gray back; so the island may be regarded as out of the range of this species.

Anous stolidus (Linn.). **Noddy.**

The Noddy, ranging as it does, practically all over the Pacific Ocean from Laysan down to Australia and the Chatham Ids., was one of the birds I had expected to find on Marcus; nor was I dis-

appointed. Judging by their numbers the island is well suited to the nidification of this tern. The nest, unlike that of the last species considered, is more commonly placed back some distance from the shore line; the preferred site is in the forks or on the limbs of the trees which grow to good size and form a thick woods in the interior. Though trees are preferred it is not uncommon to find them nesting on the ground, on fallen trunks, piles of stone or on the branches of the thick undergrowth. Rarely were nests seen more than twenty feet from the ground, and being in every stage—from just building to nests that had been deserted by the young birds—it is safe to conclude that there is no fixed time for the deposition of the eggs. There was no uniformity in the size or in the choice of the material used in the construction of the nest. The rule being a nest twelve to sixteen inches across by from two to eight inches in depth, which was composed almost entirely of twigs and sticks gathered from the ground and piled slovenly together, with a slight depression in the centre barely sufficient to keep the eggs from rolling off. As a lining, a few fresh leaves picked from the trees were commonly added; in different nests I found a few white bones, a piece of shell, some strings (from the settlement), small bunches of sea weeds—in short, any odd bits that took the birds' fancy. Some of the nests bore evidence of having been used over several times; fragments of egg shell were found in them that had been covered over with sticks, on top of which a fresh egg had been deposited. Nests were noted that were as deep as fourteen inches, and were so plastered with the excrement of the birds as to leave no doubt that they had been repaired and used year after year.

The young birds are exceedingly interesting by reason of the variation of their color while in the down; no two seem exactly alike. The forehead and crown are usually a dull white, but the body may vary from a light mouse-brown to a deep sooty brown. As they advance in age they take on the feathering of the young and immature birds, which does not vary much in color.

One or both of the old birds will always be seen about the nest at all times; not uncommonly both parent birds are sitting on the nest, one on either side of their offspring, all three making a very contented and happy looking family. Seldom do the old birds go far out to sea in search of food. If this species is to be seen in any numbers an experienced and observant navigator can feel certain

of being within fifty miles of land—usually, though not always, a low coral island. Fish of the small varieties, commonly flying-fish, is the staple food; but on several occasions I found what I believe to be fragments of squid in the stomach contents. A good sized flock was nearly always to be seen sitting on the sand beach close down to the water line, apparently sunning themselves and enjoying the roar of the ocean; for they would remain hours at a time in this way, and never did I observe them picking up food on the beach after the tide had gone out.

The birds with eggs sit quite close, allowing one to lift them off the nest, a familiarity which they resent only by picking with the beaks; but when the young are out of the shell they sit on the branches close by and never fail to swoop close to the head of an intruder, uttering their hoarse *K-r-a-u-k*, *K-r-a-u-k*, a warning which is taken up by others of their kind who come to the spot to assist their distressed neighbors. This coarse call, when taken in connection with their color, has done much, I fancy, to gain for them the not inappropriate descriptive name of "Sea Crow."

A critical comparison of the specimens secured with those in the Museum collection resulted in finding them to agree with the specimens from Guam in being slightly darker than September adult Laysan and Midway Island birds. The feet, including the soles and webs, in both adult birds from Marcus were quite black, while all the specimens from the Hawaiian Islands show more or less yellowish brown in the dry skin. The measurements carefully taken from the two adult birds agree very closely with those from Guam birds, and differ quite appreciably from those given by Mr. Saunders at page 139, vol. xxv of the Catalogue of Birds.

No.	*Sex.*	*Length.*	*Wing.*	*Tail.*	*Tarsus.*	*Toe.*	*Culmen.*	*D. of B.*
2081	♂	17.50	11.10	6.50	1.00	1.55	1.70	45
2080	♂	....	11.10	6.50	.95	1.50	1.70	50

REMARKS.—Feet blackish.

Micranous marcusi. New species. **Marcus Island Tern.**

Type. No. 2089. Bernice Pauahi Bishop Museum. Adult male. August 3, 1902. Marcus Island. Wm. Alanson Bryan.

Range. Marcus Island and adjacent waters of the northwest Pacific.

Specific Character. Lores deep black; cheeks black, though less intense than the lores; nape and shoulders sooty black with a

very slight indication of plumbeous, averaging a trifle larger than *M. hawaiiensis.* Feet in life (old and young) orange-brown, drying darker.

Description of the Type. Male: Forehead and crown almost white; back of the neck black with a slight plumbeous tinge; back, wing coverts, breast and under parts a uniform black; primaries and secondaries black; tail feathers blackish with a plumbeous tinge like the back of the neck; under tail coverts shading into harmony with the tail feathers; black of the lores extending about the eye except for a small spot on the lower lid; throat, chin and neck underneath black; feet in life orange-brown, drying darker (often black). Length in the flesh 14.50, wing 9.10, tail 4.85, tarsus .80, toe 1.30, culmen 1.80, depth of bill .30.

Adult Bird. Museum number, 2090. This March specimen is uniform with the type, except that the feet have retained the yellow color in the dry skin. Wing 8.80, tail 4.75, tarsus .80, toe 1.30, culmen 1.60.

Half-fledged Nestling. Top of the head back to the nape pure white with dark bases to the feathers; lores, cheeks and sides of the neck black; one-third of the lower eyelid white; back of the neck black; wing coverts and breast sooty black; wing and tail feathers black, darker than the back; throat, sides of the body and abdomen still covered with dark brown down; feet orange-brown in life, drying almost black; bill black.

Critical Remarks. This tern seems to be a western representative of the Hawaiian form, to which it is closely allied. Comparing the Marcus specimens with the twelve old and young birds secured by me at Midway in September, I found all the Midway birds with black feet in the flesh. Of this point I made especial note in the field. The adult birds from Midway have whiter heads and much lighter tails, and are more plumbeous over the shoulders and back of the neck. Comparing the Marcus Island birds with specimens from Oahu and Hawaii, the latter are decidedly more plumbeous all over than either Marcus or Midway birds; however, the feet have evidently been some shade of yellow in life. Laysan examples are colored more like the Oahu birds, except that the feet are dark, "parched coffee color."

The plate of the Noio given by Mr. Scott B. Wilson in Aves Hawaiiensis is a very faithful drawing of a typical Oahu bird. The

Honorable Walter Rothschild's plate in Avifauna of Laysan agrees in color with Laysan birds before me, and, I fancy, was delineated from a bird secured on that island. Both the above plates and descriptions are at variance with one another, and the Marcus Island bird sufficiently to warrant the recognition of the western form under a new name.

I regret not having a specimen in our collection of the species recently described by my friends Messrs. Heller and Snodgrass from the Galapagos under the name of *Micranous diamesus*. They remark that the Galapagos form differs from an Oahu bird sent them from this Museum "in being darker on the shoulders, on the lower parts and sides of the neck and on the sides of the head, and in having a longer and stouter bill and longer middle toe."

A perusal of the following table of measurements made up from adult males taken in the same season, but selected at random from the Museum series, shows *marcusi* to be a trifle the larger bird of the two species; also that the Midway specimens are intermediate in size.

No.	*Locality.*	*Length.*	*Wing.*	*Tail.*	*Tarsus.*	*Toe.*	*Culmen.*	*D. of B.*	*Sex.*
2089	Marcus.	14.50	9.10	4.85	.80	1.30	1.80	.30	♂
2090	Marcus.	....	8.80	4.75	.80	1.30	1.60	.30	—
9965	Oahu.	13.00	8.35	4.75	.75	1.25	1.60	.30	♂
5554	Oahu.	....	8.70	4.75	.77	1.30	1.60	.30	♂
2141	Midway.	14.20	8.80	4.70	.75	1.35	1.72	.30	♂
2133	Midway.	14.25	8.90	4.50	.75	1.35	1.75	.30	♂

I have had much pleasure in making a very careful comparison of the Marcus specimens with the thirty-four examples of this genus already in the Museum, with the result given above. In arriving at this conclusion I have resorted to characters taken from my notes on freshly killed birds, on Oahu, Midway and Marcus Islands. One of the unfortunate conditions imposed by Lieutenant Akinote was that we would not be allowed to land and use fire-arms. As a result the status of *M. marcusi* rests on the three specimens, two adults and one half-fledged young, which I was able to secure—one from an old Japanese, one fledgling from the nest, and one (the parent of the young bird taken) was obtained by me through my exertions with a bambu pole. The species was not abundant in the first place, in addition to which they were quite wary, else my series would have been more complete, for the orange-colored feet of this black tern attracted my attention at once.

At the time of my visit the nesting season was well over, many nests unmistakably of this species having been deserted by the

young birds. The nest from which the young bird was secured may be taken as fairly representative of all seen. It was placed at least fifteen feet from the ground in the vertical fork of one of the large trees growing well in towards the centre of the island. It was about eight inches across and five inches deep with a depression in the top to retain the eggs. Short sticks and straws were used to some extent in its construction, but the bulk of the material was made up of sea moss, which together with a few dead leaves were piled on top of the sticks. The whole was so plastered with the excrement of the birds as to make it a solid whitish looking mass that gave off anything but a pleasant odor. Probably not one in a hundred of the terns nesting in the trees were of this species, while its ratio to the sooty tern was not more than one to a thousand.

Gygis alba kittlitzi Hartert. **White Tern.**

This beautiful little tern was quite common on the island, where, fluttering softly about in the shade of the forest, they left with me a never-to-be-forgotten impression. So pure and white; such innocent, large, dark eyes; such trusting, fearless, gentle manners. Little wonder they are all but worshipped by the rough sailors, who have named them "love birds" or "sea fairies." A pair will always keep close together, and a sailor will tell you that if one is killed the mate will soon die of sorrow and loneliness. As a result, partly owing to tender hearts, partly owing to the old clinging superstitions of the sea, few white terns meet death at the hands of these hardy men. But fashion has a more merciless way, for the birds are much sought after by the feather dealers. Fortunately for the birds themselves it is almost impossible to kill one without in some way staining its plumage; then, too, their dark blue skin will show through the thin layer of feathers and render them unsightly and unsalable unless extra precautions are taken in removing and making up the skin. The added labor required to do this more than makes up for the advance in the price paid; hence, comparatively few of these birds are killed. Could not this be considered as a new phase of the old story of protective coloration?

Preferring the deeper shade for their nesting site, where they are to be found day or night, they will deposit a single egg, usually in the crotch of a tree, or in a crevice of the rough bark of some slanting limb; here, without a sign of a nest or protection of any

kind, the egg will be incubated, the young come out and sit until it is able to fly short distances. On some occasions I found nests as high as twenty-five feet from the ground, on others as low as

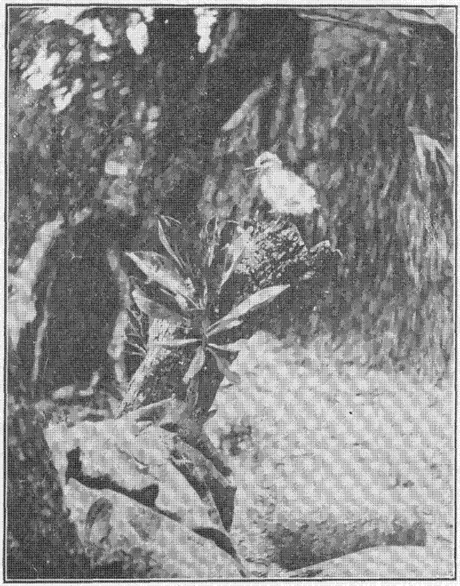


FIG. 8. Typical nesting site of the White Tern, *Gygis alba kittlitzi* Hart. The single egg is often skilfully deposited in an irregularity of the bark on a slanting limb, where, without any attempt at nest making, the young is hatched and brought to maturity.

a foot from the ground, but at no place did I see one on the ground. The young in August were most all in the pin feather and were curiously marked with rusty or clove-brown edges to part of the feathers of the back and head. Many were able to fly about with

their parents, but a few eggs were still to be seen, indicating an extended period of nidification.

Small fish seemed to be, if not the only, the chief food of this tern. On more than one occasion I saw them fluttering to and fro about the nest holding two silvery fish crossed in the beak. The interesting part the white tern takes in the exploits of the man-o'-war hawks will be described in the notes on that species.

No.	*Locality.*	*Length.*	*Wing.*	*Tail.*	*Tarsus.*	*Toe.*	*Culmen.*	*D. of B.*	*Sex.*
2094	Marcus.	....	9.10	4.30	.55	1.00	1.50	.40	♂
2093	Marcus.	12.00	9.35	4.30	.47	1.00	1.55	.40	♂
2092	Marcus.	12.00	9.10	4.25	.50	1.00	1.55	.40	♂

Diomedea immutabilis Roths. **Gooney.**

Only one bird was seen alive, and I was able to secure but one from a Japanese who had shot it on the island. He informed me that it had been taken early in the spring, and it was one of ten birds—all they had been able to get during the year.

The story of the Marcus Island colony of goonies is one of death and extermination. In the beginning of the operations of the Japanese company on the island goonies were fairly abundant. Not being able to find guano by their crude methods, they developed a scheme whereby they were able to make a marketable commodity by killing the birds and boiling them down in great kettles. The resultant, consisting of the flesh, bones and viscera, was barreled and shipped to Japan where it was used as a fertilizer. The long wing feathers of all the birds were pulled out and carefully preserved to be shipped to America and Europe and sold as "eagle feathers", which were in great demand for trimming on ladies' hats. The feathers from the breast were plucked off and sold by the pound. A profitable business was thus developed, with the deplorable result that within six years the entire colony of these splendid birds has been exterminated.

I was told that they had been so exceedingly abundant in former years that a man could kill three hundred birds in a day. The last year or so, as the colony had dwindled down, it had been the practice to kill the birds for the feathers only. All over the island were found the heaps of white bones of the birds that had thus been destroyed. I saw two or three eggs half buried in the sand that had been lying there a long time, as they were bleached out white and were very fragile.

The skin secured was that of typical *immutabilis* and measured: Length 30.50, wing 18.00, tail 5.65, tarsus 3.10, toe 4.20, culmen 4.00, depth of bill 1.35.

Diomedea nigripes Aud. **Black-footed Albatross.**

Not a single bird was seen on the island, and indeed few at any time at sea. I learned that they had formerly been almost as abundant as the white-breasted species, and had been exterminated simultaneously with them. The bird hunters did not secure a specimen during the season of 1902.

Priofinus cuneatus (Salvin.). **Wedge-tailed Shearwater.**

This "Mutton bird", as it is commonly called by sea-going people, without in any way distinguishing it from its numerous cousins, was found with eggs and young in all stages of development. As the species has been previously reported from Sulphur Island (Bonin group), Krusenstern Island (Marshall group), as well as from Laysan and Kauai of the Hawaiian group, it was not strange that it should be found at this spot, which is more or less intermediate between them all.

Flying largely at night as the species does, and consequently spending much of the day sitting about on the ground or in their burrows they are quite available for specimens, though they invariably make good use of their beaks and claws before they are finally taken. The shady interior was most frequented by them, especially the edge of the soft alluvial earthy deposits which are well suited to their burrowing habits. None were seen on the southwest point, though this portion of the island was mainly coral sand and leaf mould and quite thickly wooded. They are to be seen, a pair together, during the day dozing under a log, about the roots of the trees, under low bushes or in holes. A hole which I dug out in one of the alluvial patches was eight feet long, six inches in diameter, and eighteen inches below the surface. From it a parent bird and a downy young were taken. On the wing they fly rapidly, going far out to sea for their food. While we saw individuals almost every day during our journey to and from the island, they were far more plentiful inside a circle with a radius of say three hundred miles, a distance which they can easily go and return during the same day.

A careful study of the adults secured, in comparison with other skins from Laysan, shows no variation in color worthy of remark. The nestling in the down has not been heretofore described. A specimen (Museum No. 2116) not more than five days old is a smoky lilac-gray over the back and top of the head, and very light pearl gray on the under parts, darkest on the abdomen. The bill was olive-gray at the tip, darker at the base, drying darker. Feet bluish light flesh-color, drying buffy. I append the measurements of the seven specimens.

No.	*Locality.*	*Length.*	*Wing.*	*Tail.*	*Tarsus.*	*Toe.*	*Culmen.*	*D. of B.*	*Sex.*
2111	Marcus.	18.50	11.50	5.70	1.75	2.25	1.55	.50	♂
2112	Marcus.	18.25	11.25	5.45	1.90	2.32	1.55	.50	♀
2113	Marcus.	18.50	11.50	5.55	1.90	2.25	1.60	.50	♂
2115	Marcus.	....	11.40	5.55	1.87	2.32	1.55	.50	♀
2114	Marcus.	18.25	11.40	5.45	1.90	2.20	1.55	.50	♂
2110	Marcus.	18.50	11.55	5.55	1.85	2.35	1.55	.50	♂
2109	Marcus.	....	11.55	5.55	1.85	2.20	1.45	.50	♂

Though I took pains to look, I saw no sign of Bulwer's Petrel, Bonin Petrel, or the Hawaiian Storm Petrel; though one might, with good reason, expect to meet with them on this island.

Puffinus nativitatis Streets. **Christmas Island Shearwater.**

The seven specimens of this Shearwater that were secured form an interesting series, ranging from the young in the down through the different stages to the fully adult. The species is not uncommonly found sitting under the same bushes and roots in company with its wedge-tailed cousin and the Red-tailed Tropic Bird. There appears to be no contention among them. Unlike *P. cuneatus* they were never seen to burrow in the ground, choosing a dark cool place under any sheltering bush or root. They lay but a single smooth white egg. The season for eggs had passed by the first of August, there only being an occasional infertile one to be seen. But the variation in the size of the young bird was conclusive proof that the period of deposition was a long one.

The nestlings, in the first down, are interesting little balls of a drab color all over, without variation other than being a trifle darker on the head and rump. At this age they look not unlike powder puffs as they sit on the nest with their heads drawn in, just leaving their blue-black bills sticking out to suggest the handle. As the nestling gets older the down, which continues to grow longer and coarser, is finally followed by the first feathers. It was

interesting to note that each filament of down was the forerunner of one of the barbs in the web of a feather, and that as the feather came out and assumed proportions the filaments were sloughed off one by one, thus accomplishing the transition from down to feathers by a gradual process. The feathers of the back and wing coverts first appear; these are followed by the feathers of the breast and under parts. By the time the abdomen is thoroughly covered the wing and tail feathers are an inch or more out of the capsules. At this age the bird presents a very ridiculous appearance, having the head and neck almost bare, the body covered with short feathers, and the rump and upper and lower tail coverts still retaining the down of early youth. The head and neck are the last to feather; by that time the young bird is able to make short excursions on its own account. All during this period of growth the young birds are exceedingly fat.

In the adult the sexes are not distinguishable in plumage, and show practically no variation in color; however, the female will average a trifle the larger. The feet and toes, as well as the bills, of both old and young at all stages are black, and never yellow at the base as figured at page 45 in the Avifauna of Laysan.

Just what their food was I was not able to learn to a certainty, though I believe small squid form a considerable part of it. I never saw one regurgitate fish, though the instant the old ones are caught, or the young ones disturbed, they disgorge the entire contents of their stomachs, which, in addition to having an offensive odor, has the color and consistency of the oil to be commonly seen on opening a tin of salmon. It is almost impossible to get a specimen to the skinning table without getting this fluid on the plumage. On Marcus Island this species is less plentiful than the foregoing, though it is to be seen far out at sea, often hundreds of miles from the nearest land. Three adults give the following measurements:

No.	*Locality.*	*Length.*	*Wing.*	*Tail.*	*Tarsus.*	*Toe.*	*Culmen.*	*D. of B.*	*Sex.*
2102	Marcus.	14.50	10.00	3.80	1.65.	1.90	1.25	.40	♀
2103	Marcus.	14.00	9.50	3.55	1.60	1.90	1.20	.40	♂
2104	Marcus.	....	9.75	3.60	1.60	1.95	1.20	.40	—

The male bird, No. 2103, was covered with no less than forty of the sticky seeds from one of the principal trees on the island, an interesting specimen, showing the part these birds take in distributing certain non-edible seeds.

Phaethon rubricauda Bodd. **Red-tailed Tropic Bird.**

This interesting bird, as the generic name bestowed by Linnæus implies, follows the track of the sun throughout the tropics where it is found nesting on almost all of the low bird islands throughout its extensive range. At the island whose avifauna we are considering it was quite abundant, as instanced by one of the Japanese, who, for wanton destruction, killed thirty-five specimens in less than two hours. Though to be met with all over the island, they prefer the deeper shade and more quiet parts for rearing their young. This function must occupy the greater part of their time, judging from the fact that fresh eggs were secured on August 5, while at the same time young of the year were ready to leave the nest.

The nest is a simple depression in the sand or earth under a log, bush, root, or tilted stone. No lining is added, and never more than one egg is laid. Both birds assist in incubation; often both will be seen on the nest at the same time. They will not leave the egg when disturbed, but, to the discomfort of the intruder, will make a hoarse undescribable clattering noise, lasting several seconds.

The downy chick when first hatched is one of the most interesting little birds I ever saw. The upper parts are colored a fine light smoky gray, the under parts almost pure white. The down is exceedingly long and very fine, forming about the head a hood, suggesting a court wig, out of which the small bead-like eyes peer inquiringly, giving the chick a most dignified expression. The feathers on the wings appear first, and, like the whole upper surface, are barred and spotted with black in the first plumage.

Fish is the principal, and, so far as I know, the only food of both young and old. One young bird I secured gave up three flying-fish from six to seven inches long, together with a quantity of the salmon oil slime elsewhere referred to. The three fish must have weighed very nearly a pound. If the fat and heavy condition of the young is any index, the old tropic-birds are experts at fishing. This bird, so easy to capture on the nest, is one of the most difficult to kill that has come under my notice. By the ordinary method of compressing the lungs and heart between the fingers and thumb, ten to twenty minutes must elapse before the bird is dead past reviving in the collecting bag. The tenacious hold they have on life,

coupled with the copious way they bleed when injured, has won for them great respect in the minds of the sailors, who will rarely harm one for fear of visiting some calamity on his vessel by so doing. I have carefully taken the following measurements from the four birds secured.

No.	*Locality.*	*Length.*	*Wing.*	*Tail.*	*Tarsus.*	*Toe.*	*Culmen.*	*D. of B.*	*Sex.*
2072	Marcus.	28.00	12.70	14.00	1.00	1.90	2.30	.85	♀
2073	Marcus.	26.00	12.40	11.50	1.00	1.80	2.40	.80	♂
2071	Marcus.	....	12.20	13.75	1.00	1.85	2.50	.90	♂
2074	Marcus.	....	12.20	15.25	1.00	1.75	2.25	.90	♂

Sula cyanops Sundev. **Blue-faced Booby.**

Only a few individuals of this species were to be seen sitting on the black rocks on the reef, and since I was not permitted to use a gun, I did not secure a specimen. Earlier in the season the Japanese had brought a young one to camp and reared it by hand, feeding it on fish. It had become quite tame and showed *some* signs of intelligence, as coming about for food when the fishermen opened their catches. Picking, biting, snapping and hissing at all passers-by, it was in every way a bossy, impudent nuisance about camp. During a rain storm this young booby would fly up into a stump of a tree that formed its favorite roost, and alternately flap its wings and then hold them out from its body, evidently greatly enjoying its shower bath. When sleeping it would perch resolutely on its stump, stand every feather on end, turn its long head and neck down over its back, tuck its bill under its wing, and thus be lost to the scenes about for hours at a time.

Sula piscator (Linn.). **Red-footed Booby.**

None of this species was noted on the island, and but few were to be seen on the reef. The last day we were on the island (August 7) one of the Japanese went out and got five from off the rocks, of which I secured one, an adult male, Museum No. 2075. Its measurements are: Length 29.50, wing 15.25, tarsus 1.25, toe 2.90, culmen 3.30, depth of bill 1.10.

Sula sula (Linn.). **Booby.**

On the beach underneath the trees, well above the line of the highest tides at the northern point of the island; were found the colonies of this widely distributed "Sea Fool" or Booby. Thousands of them were to be seen on the wing, sitting on eggs, or feed-

ing their half-grown young. The nest, a low flat heap, invariably placed on the ground, is a rude structure twelve to twenty inches across by from two to six inches high, composed of sticks, dry leaves and rubbish piled loosely together, in the top of which is a depression to retain the eggs. Some nests were little more than wallowed-out places in the sand. The edge of these had been finished off, as a rule, by the addition of such leaves and twigs as the mother bird could reach without leaving the nest. Owners of these more slipshod excuses for nests seemed conscious of being remiss in the performance of this preparatory maternal function. Whenever we would approach they would at once busy themselves in rearranging the meagre materials about them. Picking up a stick from one side and carefully laying it down on the other; catching up a leaf here and putting it where the stick had been. Thus they would appear entirely engrossed until we came within a few feet, when, after hissing and snapping their bills a few times, they would disgorge such food as they might happen to have, and clumsily leaving the nest would go off to sea, always returning in a few minutes to see what might have happened during their absence.

Two eggs were the usual complement, though not uncommonly only one was deposited. One is usually quite soiled, evidently by the bird's feet, while the second and last to hatch is always clean and fresh looking.

From the difference in the appearance of the two nestlings I conjectured that a period of ten days must have elapsed between the deposition of the eggs. The chicks, when first out of the shells, are repugnant looking, naked little things, but they rapidly grow a coat of fine white down which they retain until about half-grown. At this period they look like veritable "fools in the down", and make the name "booby" equally as applicable to the young as the old. The first new dark feathers to show are the coverts along the humerus, the primaries and the tail feathers. As the bird begins to feather the down is ebraded from the ends of the barbs of the feathers, which leaves the new plumage over the back clove-brown with paler edges. The eggs are incubated and the young fed by both parent birds. Fish is the food most in favor. It is taken by the young putting their bills crosswise in the open mouth of the parent bird, when they receive their nourishment without farther ado.

A hissing noise made by both old and young birds when disturbed is not unlike that made by a setting goose; but the bite of

an old booby is a thing to be long remembered. Two adult birds, Museum Nos. 2076 (ad.) and 2077 (f.), measured respectively: Length 30.00, 31.00; wing 15.50, 15.75; tail 7.75, 8.50; tarsus 1.90, 1.75; toe 3.30, 3.25; culmen 4.10, 3.90; depth of bill 1.35, 1.30.

Fregata aquila Linn. **Man-o'-War Bird.**

Sailing about high overhead this avian pirate of the tropical seas was to be seen almost every day during the course of our long, tedious voyage. It became more abundant as we approached the little speck of land that formed the object of our journey. We found it nesting, not in great numbers to be sure, but sufficiently abundant to warrant it being called very common. Having in mind previous accounts of the species nesting on low scrub bushes, on grass tussocks, and even on the ground, as well as on the face of cliffs, it took two or three days for me to give up the idea of finding it rearing its young in nests similarly placed. However, after some search I found the hawks nesting in two distinct colonies a little way from the centre of the island towards the north point; not near the ground, as I had expected, but in the very topmost branches of the tallest trees that grew about the curious open spaces in the thick wooded part of this island. Some sites were thirty-five feet or more from the ground. The bulky pile of loose sticks that formed the rough platform nest on which the half-grown young were sitting had evidently been broken from the dead limbs of blighted trees near at hand, as the fresh ends of the sticks testified. These platforms varied greatly in dimensions; some—twenty inches across and eight inches deep—had to all appearances been made new that year; some more bulky ones had been repaired and used over several times. As stated twigs were the principal building material, though dried leaves and occasionally a few white bones were seen in the nests; but without exception all were badly befouled with the birds' excrement. The young were all more than half grown and were not very closely attended by the parents, though I saw several feeding their young on the plunder they had secured from the boobies. I had read much when a boy of this natural bird pirate, that feeds on the fish caught by other sea fowl; but what I had heard and read about it did little to detract from the interest I felt in watching for the first time in my life the exploits of an accomplished robber.

I have before referred to the large colonies of common brown boobies about the north point of the island. It was in the vicinity of this colony that the man-o'-war birds were the most abundant. Here they would lie in ambush for the old boobies and tropic birds as they returned from the sea heavily laden with fresh food for their young. Sitting quietly on the tree tops, or more often wheeling high overhead industriously patroling the island, out where the surf broke on the reef, these birds would keep a sharp lookout to sea for a sight of the returning fishing fleet of boobies. Sighting one (sometimes consisting of one, sometimes of several individuals) as many as half a dozen hawks would make for them under full sail, and without a moment's warning would engage a hapless bird in battle. Swooping down upon it from every side, buffetting it with their wings, snapping at it with their long hooked bills, flying now above, now before, now below it, the hawks would so confuse their victims that eventually, feeling that the only safety for its life lay in letting go part of its store of supplies as a sop for its assailants to quarrel over, the booby would on a sudden drop one of its fish, whereat the hawk would swoop down, more rapidly than the eye could follow, and catch the food before it had touched the wave, then taking it securely in its bill would fly majestically off to feed its own ever expectant offspring. The unfortunate booby meanwhile was farther pursued by the less fortunate hawks until, reft of all her quarry, she was allowed to return to her young.

On the fringing reef hereabout were exposed a number of large blocks of coral stone that served an interesting purpose in these sea battles. If a booby succeeded in warding off or evading her pursuers from the first attack she would set a course direct for one of these rocks, the hawks usually increasing in numbers at every moment in hot pursuit. Perhaps another fish would be dropped on the way, but if at last the bird was able to make this place of safety its pursuers would mount high in air, or, to use a sea term, lay off and on, sailing back and forth always keeping the sharpest watch on the brown object sitting quietly on the rock. After a short rest and choosing a favorable opportunity when its pursuers were at some distance the booby would make a final dash for the shore. The nearer it got to the beach the more furious grew the conflict; for in addition to the hawks both the noddy and white terns would take a hand in the robbery. It often occurred that a bird that had

let go its catch one by one as it came in would here, within fifty yards of its nest, disgorge its last fish, which would be eagerly caught up by any one of its pursuers that was able to secure it. Panting and excited the old boobies would drop down on arriving at the colony in an exhausted condition.

The frigate birds showed much discrimination, selecting at once the boobies that were most heavily laden and consequently more liable to pay generous toll when brought in contact with this high-handed system of exacting customs duties. Though tropic birds were attacked they were more rapid flyers and more expert at evading pursuit. As in the story of the two dogs that quarrelled over a bone, it was not uncommon in the performances I have described to see the tiny white tern reap the most substantial benefit from one of these encounters. Battles similar to those mentioned were to be seen during the entire day, but towards nightfall they were more numerous as well as more severe.

Four young birds, Museum Nos. 2096-99, were secured from the nests. The old birds kept out of reach of a bambu pole which was my only weapon.

Tringa acuminata (Horsf.). **Sharp-tailed Sandpiper.**

A single example, undoubtedly of this species, was seen at close range on August 6, on the beach towards the north point.

Heteractitis incanus (Gmel.). **Wandering Tattler.**

A poorly mounted bird, Museum No. 2100, was secured from a Japanese. It has the nasal grooves extending forward more than two-thirds the length of the bill. The measurements are: wing 6.60, tail 2.75, tarsus 1.35, toe 1.30, culmen 1.50, depth of bill .27. The tarsus is irregularly plated behind for two-thirds its length, a fact which is disquieting to the range usually assigned the two species in this ocean if taken in connection with the locality the specimen comes from, and also that it was secured during the spring months. I saw several individuals on the beach, but secured only the one measured above.

Charadrius dominicus fulvus (Gmel.). **Pacific Golden Plover.**

One bird was flushed while crossing one of the patches of alluvial deposit, and one bird was secured from the foreman of

the company. The bird measures: Length 9.90, wing 6.45, tail 2.55, tarsus 1.80, toe 1.30, culmen .95.

Arenaria interpres (Linn.). **Turnstone.**

On August 4 I saw a flock of eleven of these interesting birds at close range while they were feeding along the beach, but owing to the regulations concerning firearms I was not able to kill one, though I am as positive as I could be under the circumstances of the identity.

REPTILIA.

As was to be expected on an island scarcely more than a square mile in extent the species of reptiles were but few, in fact only a representative of each of the two widely distributed Polynesian families were secured, though the number of individuals were exceedingly abundant. I am indebted to Dr. Leonhard Stejneger, Herpetologist of the Smithsonian Institution, for the verification of the species collected.

Family **Geckonidæ.—The Geckos.**

Perochirus articulatus (Fischer).

This interesting gecko was found in abundance all over the island, especially in hollow trees or under loose bark. Usually during the daytime they kept themselves well concealed, but at nightfall they came out and were plentiful all about the thatched huts as well as on the trees and bushes. Rarely did I see them on the ground. A number of the eggs, supposed to be of this species, were found secreted under the bark on a dead tree. Dr. Stejneger informs me that this gecko has hitherto only been known from the Caroline archipelago. A good series was taken illustrating many interesting details in the varying coloration of the species, as well as showing successive steps in the acquisition of a new tail.

Family **Scincidæ.—The Skinks.**

Ablepharus boutonii var.

The skink was if anything more abundant than the gecko, but both were too numerous to admit of their being regarded as recent arrivals. In addition to inhabiting the trees and huts these active little fellows were not infrequently seen on the ground and under

stones, as well as in clumps of grass growing close down to the waters' edge. Although abundant they were exceedingly difficult to catch, being as quick as a flash and never venturing far away from some hiding place.

In addition to the specimens retained by this Museum a series of both species has been deposited in the National Museum at Washington.

PISCES.

A small collection of fish, numbering some seventy species, was made, which on examination has proved to be of more than passing interest. It has been found impossible to prepare the annotated list for publication in this paper as first planned. However, it will appear later under a separate title.

INSECTA.

I was to considerable pains to collect a series of the insects on the island, but unfortunately the specimens were all unavoidably destroyed by ants or other pests on the vessel during the return voyage. In addition to sweeping the plants and grasses with a collecting net I examined dead wood, bark, and leaves carefully, as well as making repeated searches under logs, stones and decaying flesh for specimens. Rainwater tanks about the settlement were visited by day and night, traps were also constructed of cans and bottles, and I put in several hours on two still evenings in an attempt to attract insects to alight on our tent as a screen, using a strong ascetyline light to allure them. As a result of my efforts I was not able to secure more than a dozen species all told. In fact, as a pastime on our journey to the island I made a collection of insects on board the schooner that far outnumbered the species I was able to collect on land.

A small red ant was quite common as well as troublesome, especially about the settlement. I fancy it had been imported since the colony was established. Two species of flies were very abundant, one a blow fly (*Caliphora?*) which persisted in laying its eggs on the dead birds both before and after they were skinned; the other species, a small vinegar fly, of a genus unfamiliar to me, were to be seen in moist, shady places all over the island. A small miller was common during the night, and I am of the opinion that

the skinks and geckos feed on it as well as on the small flies just mentioned.

The birds were infested with various species of *Mallophaga*. A large gooney louse was quite troublesome to the Japanese by reason of its poisonous bite which caused painful, ulcerous sores to break out on the hands and legs. Fully two-thirds of the colony were disfigured by them in this way.

The only spider that had established itself was the widely distributed web-spinning species, *Epeira nautica* Koch. Their stout webs were stretched from tree to tree in such a way as to be a nuisance as we walked through the forest. The trees and grass showed little or no signs of insect pests. In fact I found only one species of plant that had been molested by biting insects. Since these depredations were to be seen only in a very limited area, and as I was unable to secure the miscreant either by day or night I concluded the species must have been a recent Japanese introduction that had not had time to thoroughly establish itself. No species of Coleoptera were secured.

CRUSTACEA.

The small collection of crabs secured consists of eleven species, four of which were found abundant on the land, while the remaining seven were collected on the reef and may be considered as representing the commoner form to be met with in the waters about the island.

The land crustacea make up in numbers and activity for their comparative poverty in kind, and are exceedingly important agents in the economy of the island. In addition to acting as general scavengers certain of them take the place of earth worms by aiding in mixing light surface materials into the sand; while others, as the *Coenobita*, by bringing shells to serve as habitations and subsequently discarding them inland, aid in a material way to the building up of the land.

To Miss Mary J. Rathbun and Mr. J. E. Benedict, both of the National Museum at Washington, I am indebted for assistance in the determination of the species and for many courtesies.

Geograpsus grayi (M. Edw.).

By far the most common species on the island this interesting crab was everywhere abundant, especially about the settlement

and in the coconut grove. By day they were to be seen feeding on fallen coconuts and bits of refuse; at night they were even more active and were often heard scurrying about in the coconut thatch overhead. Frequently they were found in our larder helping themselves. When disturbed they would move off sideways a few steps and stop to observe the intruder, assuming an attitude of both importance and injury that was most ludicrous to behold.

Grapsus grapsus (Linn.).

Almost as abundant as the preceding species and similar to it in habits.

Geograpsus crinipes (Dana).

Judging by the specimens secured this is not an abundant species on the island.

Leptodius sanguineus (M. Edw.).

Common species on the rocks, and was frequently secured in the small mesh nets used in fishing.

Petrolisthes speciosus (Dana) var.

A number of specimens of this active crab was secured In life they are bluish all over, variously marked with small black spots.

Cœnobita olivieri Owen.

This bright red crab was an abundant species and to be seen day and night often well inland. They usually congregate about the dead bodies of birds, on which they feed; however, they are good climbers, as many of them were found well up in the trees where they had evidently gone in search of food. When disturbed in any way they simply let go their hold and dropped to the ground with a heavy thud. As a habitation the cast off shells of *Turbo radiatus* Gmel. seemed to be preferred by them, though other shells were often used.

Cœnobita compressa Guérin.

I did not find *C. compressa* quite as abundant as the foregoing species. Specimens collected inhabited the shells of *Turbo argyrostomus* Linn.

Calcinus elegans (M. Edw.).

A number of specimens were secured in the small nets used for fishing. In every instance they were domiciled in the shells of *Ricinula horrida* Lam. A color note states that the legs were a bright blue in life while the claws were brown.

Pachygrapsus plicatus (M. Edw.).

In life olive green, with some darker spots, the whole surface washed with darker shades.

Lydia annulipes (M. Edw.).

But a single specimen of this rare crab was secured.

MOLLUSCA.

The collection of shells listed below was for the most part secured from one of the Japanese residents on the island, who, as it has been remarked before, had some taste for natural history; as a result he had devoted his leisure hours for several months to picking up shells on the beach and reef. Comparatively few of them were live shells, while many were mere fragments which served only to indicate the presence of the species. The list, although only a partial one, will serve to show the species to be met with in that part of the Pacific. No land shells were noted, and I believe there were none. Thanks are due my friend Mr. Paul Bartsch, of the Division of Mollusca, National Museum at Washington, for assistance in the determination of the species.

Conidæ.

Conus vautieri Kiener.
pulicarius Hwass.
hebræus Linn.
vermiculatus Lam.
taheitensis Hwass.
miles Linn.
catus Hwass.
miliaris Hwass var.
lividus Hwass.
striatus Linn.
archepiscopus Brug.
Conus tulipa Linn.
omaria Hwass.
clavus Linn.

Olividæ.

Oliva irisans Lam.
guttata Lam.

Harpidæ.

Harpa minor Lam.

Mitridæ.

Mitra episcopalis Linn.

Mitra paupercula Lam.

Buccinidæ.

Tritonidea undosa Linn.
fumosa Dill.
Peristernia incarnata Dkr. var.

Muricidæ.

Purpura persica Linn.
Ricinula ricinus Linn.
horrida Lam.
Sistrum morus Lam.
Rhizocheilus madreporarum A. Ads.

Tritoniidæ.

Triton chlorostomus Lam.

Cassididæ.

Cassis vibex erinaea Linn.

Doliidæ.

Malea pomum Linn.

Cypræidæ.

Cypræa tigris Linn.
reticulata Martyn.
achatina Sol.
scurra Chemn.
moneta Linn.
arenosa Gray.
talpa Linn.
helvola Linn.
erosa Linn.
arabica Linn.
caput-serpentis Linn.
carneola Linn.
mauritiana Linn.
isabella Linn.
lynx Linn.
Cypræa vitellus Linn.
poraria Linn.
Pustularia nucleus Linn.
Eponia cicercula Linn.

Strombidæ.

Strombus gibberulus Linn.

Cerithiidæ.

Clava asper Linn.

Naticidæ.

Natica marroccana Chemn.

Turbinidæ.

Turbo argyrostomus Linn.
radiatus Gmel.

Neritidæ.

Nerita plicata Linn.
polita Linn.
Neritina sp.
Neritina sp.

Pectinidæ.

Pecten pallium Linn.

Dreissensiidæ.

Septifer bicularia Linn.

Tridacnidæ.

Hippopus maculatus Lam.

Veneridæ.

Venus puerpera Linn.
Circe pectinata Lam.

Tellinidæ.

Asaphis deflorata Lam.

Pyramidellidæ.

Pyramidella sulcata A. Ads.

VERMES.

Believing that a collection of any earthworms that might occur on the island would be of interest I requested Mr. Sedgwick and his assistants to keep a close lookout for them. Although they made a large number of excavations in various places while prosecuting their investigations they were unable to discover a single specimen. The conditions in and about the dry lagoons seemed most favorable, as the soil was there composed of rich loose alluvial earth. Since no specimens were collected, or even seen, by any of our party I am persuaded that worms of this class have not as yet found their way thither.

BOTANY.

Ten species of indigenous plants were found growing at the time of our visit, none of which could be said to be peculiar to Marcus Island. The few species that have found their way thither through natural agencies are of those widely distributed, hardy, pioneer plants which are well adapted to maintain life on an isolated speck of coral sand, where rain is uncertain, soil unproductive, and storms often violent.

By referring to Figs. 2, 3, 5 it will be seen that the land is fairly well covered with vegetation of one kind or another down to the high water mark. There seems to be but little contention among the few species as all have found conditions more or less suitable to themselves, so that all work together for the upbuilding of the island and the enrichment of the soil. The coconut palm, *Cocos nucifera* Linn., the only plant of economic importance, is well established growing in the larger of the dry lagoons in the centre of the island. Perhaps three acres have been thickly planted by nature to this most valuable palm. All the trees of sufficient age were in bearing. The nuts were not especially large, nor the trees prolific, although there was sufficient fruit to more than supply the colony at all times. The Japanese put the tree to many uses; the trunk is used to form the sills and principal posts of their shacks; the leaves made an excellent thatch; the nut shells were of service as utensils; the midrib of the leaves made serviceable poles with which they secured the birds to be skinned. The trees must have been of great age, as many of them were sixty feet in

height. Their feathery plumes, lifted high above all else, gave a pleasant variety to what would otherwise have been a monotonous forest and sky line. The colony unfortunately are working a serious damage to the grove by the methods they have adopted to secure the nuts. With a large knife they hack great notches into the trees in such a way as to form a ladder of the trunk, a practice which will surely result in the death of the palms. Some effort has been made by them to extend the cultivation of the palm by transplanting young trees into open spaces. All plants thus reset seemed to be doing well. It was the opinion of Mr. Sedgwick and myself that the entire island could with little difficulty be planted to this palm.

A large boraginaceous tree, *Tournefortia servicea*, was by far the most abundant species on the island, growing and thriving everywhere it made in many places an almost impenetrable jungle. The larger trees attained a height of more than thirty-five feet, with trunks often two feet in diameter. The wood was of little service, being very brittle and decaying rapidly.

Next in importance was a splendid tree of the order *Rubiaceæ*, producing a one-celled seed. It was impossible, however, to procure sufficient material for a satisfactory determination of the species. I brought living plants with me to Honolulu which are now growing in Kapiolani Park. The tree, while thriving over the greater part of the island, found its most congenial habitat in and about the dry lagoon where trees thirty or more feet in height with wide-spreading branches covered with large thrifty green leaves made a pleasant shade. The seeds have a peculiar property of excreting a sticky fluid from the pores on the angles. This substance coming in contact with the feathers of the birds frequenting the shade adheres to them firmly. Without doubt this species is carried from island to island by birds in this way.

The common *Portulaca lutea* Sol. was well established, growing in bunches here and there all over the island, though it was more abundant on the seaward slopes.

A species of *Euxolus* was sparingly distributed over a limited area a short distance back of the camp. It showed the effects produced by some biting insect.

Of the grasses but two species were found. *Panicum pruriens* Trin. had gained a footing and was growing luxuriantly on the

rich crown earth inland. The widely distributed genus *Rottboellia* was represented by a species belonging to the sub-genus *Cœlorhachis*. The plant attains a height of ten inches, always growing in isolated bunches on the sand.

Of the three remaining species, one, a low trailing herb with reddish stems grows abundantly on the open spaces inland. The two other plants, so far as I could find, were represented by one or two individuals each. One, a bush growing six or eight feet high, had its stems thickly covered with short, stiff spines; the other species bore its asymmetrical leaves in pairs on short petioles which united into a single slender foot stock. The plants found were about six feet in height. The two last mentioned must have been of exceedingly recent introduction.

The Japanese had attempted to grow a number of economic plants. A few bananas were growing in an open space, but they had never fruited; this was most likely due to a want of sufficient rain; the soil and climate must have been suitable. A few pineapples had been planted, and the dozen or so plants were barely alive. Tobacco, *Nicotiana tabacum* Linn., flourished on the rich soil. Leaves twenty inches long and seven inches broad were seen. Perhaps two acres were under cultivation. The Japanese were able to smoke it, but it proved to be of an inferior quality. A cabbage and a species of bean had also been introduced.

It may be of interest to note for future reference that we gave seeds of the following plants to the Japanese, who offered to plant them: papaya, watermelon, muskmelon, cherry, soursop, rose-apple, turnip, squash, raddish, spinach, cabbage, tomato, bean, corn, algaroba, ironwood, *Eucalyptus* sp., *Cryptomeria japonica* and *Poinciana regia*.

APPENDIX.

I TAKE much pleasure in finally being able to present the following account of the fish collected in the waters about Marcus in the form of an appendix to the monograph[6] of that island. The impossibility of securing anything like a complete collection of the fish about the island in the brief time at our disposal can well be understood. However, the following list, accompanied by the description of eight new species, will serve as an index to the fauna to be met with in that region.

The greater part of the collecting was done at night with a mosquito net seine and a small hand net. For the want of better equipment long-necked bottles were baited and used as traps. In addition to the night work some time was devoted to fishing with a hook and line, as well as to poisoning and the discharging of a few blasts in the deep water (four to six fathoms) outside the reef. All of the methods used were accompanied by more or less satisfactory results. A Japanese was employed for two or three days who exhibited considerable skill in spearing certain of the larger specimens secured. With a pair of close fitting goggles firmly fastened over the eyes he would dive for great distances, thus approaching his intended victim without creating the disturbance usually made by wading or swimming through the water; he was thus enabled at the same time to watch the movements of the fish. When within spearing range this astute fisherman would stealthily raise himself and hurl a slender barbed spear with great precision.

Fish was a daily article of food and furnished a welcome addition to the Japanese residents' meager fare. The supply seemed never failing, and certain species were always to be had in abundance. Many of their native dishes, though crudely prepared, were quite palatable.

I was informed by Captain Rosehill that at the time of his first visit to the island sharks were exceedingly abundant and troublesome. I learned from one of the settlers that small Japanese fishing

[6] See Pisces, page 117.

boats had called there and found shark fishing profitable some years before, but at this time few were seen and no specimens secured.

On my return to Honolulu a preliminary examination of the material secured brought to light a number of interesting specimens. The aid of Dr. C. H. Gilbert, who had kindly offered to assist the author of this monograph in mooted questions of nomenclature, etc., was accordingly sought. A portion of the collection was subsequently forwarded to him. Mr. Albert C. Herre, of Stanford University, volunteered to help in bringing this list to a completion; he has written the descriptions of all the new species and has added many notes and observations of value. Dr. Gilbert, in commenting on the collection, says (*in litt.*) that "If the Marcus Island fauna had turned out to be an extension of the Hawaiian fauna we could have sent you a list in a few days. But there are apparently very few Hawaiian species found there, the complection of the fauna being of the South Seas."

The numbers given are those of the specimens in the Bishop Museum. A duplicate series will be deposited in the Leland Stanford Jr. University. The arrangement followed is, so far as possible, that of Jordan and Evermann in their work on the Fishes of North and Middle America. Color notes were frequently taken from the fresh specimen.

In conclusion I wish here to express my indebtedness to Dr. Gilbert and his associates at Leland Stanford Jr. University, as well as to Mr. Seale of the Bishop Museum staff, for their kind and generous assistance. To Mr. Herre, who shares the authorship of the appendix, I am especially beholden. W. A. B.

ANNOTATED LIST OF THE MARCUS ISLAND FISHES.

BY WM. ALANSON BRYAN AND ALBERT C. HERRE.

FAMILY MURÆNIDÆ.—THE MORAYS.

2403. **Gymnothorax detactus.** New species.

Head 3.33 to anus, 7.20 in total length; head and trunk shorter than tail; depth 14 in total length; snout .20 of head; eye .60 of snout, 8.33 in head; gill opening small, less than diameter of eye; interorbital space, flat, grooved, its width equal to diameter of eye; lower jaw weak, inferior; teeth uniserial; a row

of three depressible teeth on vomer. Anterior nostril on tip of snout above lip, its tube a little more than .50 diameter of eye; tip of snout keeled; between tube of anterior nostril and keel is a mucus pore; posterior nostril without tube, situated above anterior portion of eye; a pore midway between posterior nostril and tip of snout; a row of four pores on the sides of each jaw. Origin of dorsal in advance of gill opening, its height contained 8 times in length of head.

Color in alcohol: purplish brown, everywhere marked with very numerous irregular dark brown transverse bands, those on middle and anterior portion of body dendritic; paler on belly and throat, the latter becoming pale reddish. B. P. B. Mus. No. 2403 is the type.

2404. **Muræna nebulosa** (Bl.).

A single specimen.

Family HEMIRHAMPHIDÆ.—The Balaos.

2405. **Hemirhamphus depauperatus** Lay & Bennet.

Family EXOCŒTIDÆ.—The Flying-fishes.

2406. **Exocoetus volitans** Linn.

Family MUGILIDÆ.—The Mullets.

2407. **Chænomugil nauticus.** New species.

D. IV–I–9; A. III–10; scales in lateral series 50. A long pointed scale at base of spinous dorsal and base of ventral; greatest depth of body nearly equal to length of head, 5.50 in total length; head a trifle less than 5 in total length; eye equals snout 3.50 in head. Upper lip not thick, notched; lower lip with a ridged knob at tip, which fits into notch of upper lip; both lips fringed with numerous ciliated teeth, the tips bifid or trifid. Maxillary entirely concealed when mouth is closed; interorbital space broad, very gently convex, 3 in length of head. Origin of spinous dorsal midway between tip of snout and base of caudal; origin of anal fin forward of soft dorsal; first ray of soft dorsal .80 of length of head, equal to longest rays of anal; caudal forked, longest rays scarcely as long as head.

Color in alcohol: silvery, dorsal region darker. Margin of soft dorsal and caudal dusky; other fins pale or colorless, except

that in some specimens the anal has a dusky margin. B. P. B. Mus. No. 2407 is the type.

Family HOLOCENTRIDÆ.—The Squirrel-fishes.

2408. **Myripristis adustus** Bleeker.

2409. **Holocentrus diadema** Lacép.

2410. **Holocentrus tiereoides** Bleeker.

D. XI–14; A. IV–9; lateral line 42. Depth 2.75 without caudal, 3.33 with caudal; head 2.88 without caudal. Eye 3 in head, to end of opercular spines. Depth of caudal peduncle 4 in head. Two opercular spines, the upper the larger. Third anal spine very stout and long, equal to distance from snout to posterior edge of preopercle.

Color in alcohol: brown with reddish cast. A red-brown line at base of spinous dorsal. Two golden longitudinal lines above, and six below the lateral line. Fins pale, uniform. Membrane of spinous dorsal more or less suffused with rose color.

2411. **Holocentrus binolatum** Quoy & Gaim.

Family MULLIDÆ.—The Surmullets.

2412. **Mulloides samoensis** Günth.

2413. **Pseudupeneus bifasciatus** (Lacép.).

Three very young specimens. Color in life: "Barbules and lower fins yellow. Dorsal reddish pink. Body crossed by two darker bands; light bands yellowish."—Bryan. Color in alcohol: from head to origin of spinous dorsal a broad poorly defined blackish band running down to belly; a similar band from soft dorsal to anal; between these two a broad pinkish band; caudal peduncle yellowish, inclined to pinkish. Fins all pale, except spinous dorsal, which is barred with dusky, becoming blackish near margin.

Family CARANGIDÆ.—The Pompanos.

2414. **Caranx melampygus** Cuv. and Val.

D. VIII–I–23; A. II–I–18; scutes 40. A young specimen 106 mm. long. The number of scutes is greater than the typica

number owing to the immaturity of the specimen, in which the anterior ones are more obvious than in the adults.

Family KUHLIIDÆ.

2415. **Kuhlia malo** (Cuv. & Val.).

Color in life: "Silvery bluish on the back; tail with a black margin."—Bryan. In alcohol: general color silvery white; bluish gray on the back; caudal and dorsal fins with a marginal black band.

2416. **Kuhlia tæniura** (Cuv. & Val.).

Color in life: "Silvery bluish over the back; tail with two diagonal stripes."—Bryan.

2417. **Kuhlia marginata** (Cuv. & Val.).

D. x–11; A. iii–12; lateral line 44. Color in alcohol: silvery brown, darker above, where it is covered with more or less distinct dark brown spots. A row of brown spots at base of anal. Soft dorsal and anal with a black band at margin; another black band composed of longitudinal blotches occupies the middle portion of each fin. Spinous dorsal membrane edged with black. Two oblique black cross bands on caudal, the posterior, marginal one distinct, the inner, anterior one, broader and ill-defined.

In general appearance and color the specimen strongly resembles *Kuhlia rupestris* (Lacépède), but differs in some minor characters. Examination of a number of specimens of *rupestris* in the L. S. Jr. University Museum shows a constant difference in the number of anal rays, *rupestris* having 10, the Marcus Island specimen having 12.

Family SERRANIDÆ.—The Sea Bass.

2418. **Epinephelus spiniger** (Günth.).

Previously described from a single specimen in the British Museum, from an unknown locality.

D. xi–16; A. iii–8; lateral line 70. Total length 198 mm. Depth 3 in length without caudal, 3.50 in total length. Head 2.75 in length without caudal, 3.20 in total length. Eye 5 in head; snout 4.33; interorbital space 6.66. Lower jaw strongly projecting; maxillary extending beyond vertical from posterior margin of eye, its posterior end .66 of diameter of eye. Preopercle

rounded, serrations enlarged at angle; opercular flap pointed; opercle with three nearly equidistant spines, the middle one much the largest and strongest, the upper one inconspicuous and anterior to the others. Gill rakers short, 12.

Teeth in bands, in two series on the sides of mandible, inner series much enlarged. Canines strong, those of lower jaw visible when mouth is closed.

Anterior nostril round, covered by an elongate, membranous flap; posterior nostril slightly larger, nearly circular.

Scales small, ctenoid over body; head covered with cycloid scales; a tine patch on maxillary. Breast and entire belly covered with cycloid scales; all cycloid scales with numerous accessory scales.

Origin of dorsal above base of pectoral; first spine less than .33 of second, which is .50 of head, far exceeding the others both in length and thickness; the other dorsal spines sub-equal, a little more than half length of second spine. Soft dorsal shorter but higher than spinous dorsal, the longest rays being about .75 of second dorsal spine.

Caudal truncate; pectoral .66 of head; rounded; ventral .58 of head, not quite reaching anus; anal rounded; first spine .43 of second; second and third stout, sub-equal.

Color in alcohol: Uniform pale brown over body, except upper part of head and along base of dorsal, where it is darker. Spinous dorsal with a black margin; spinous and soft dorsals dark brown, the latter with a pale streak toward margin, outside of which is a blackish line, the free ends of the rays being edged with white; caudal similar to soft dorsal; anal brown with traces of dark brown spots; border of fin dusky; pectoral pale brown.

2419. **Epinephelus merra** Bloch.

2420. **Epinephelus hexagonatus** (Bl.).

Family LUTIANIDÆ.—The Snappers.

2421. **Lutianus bohar** (Forskål).

2422. **Lutianus quinquelineatus** (Cuv. & Val.).

2423. **Lutianus bengalensis** (Bloch).

2424. **Pentapus aurolineatus** (Lacép.).

FAMILY SPARIDÆ.—THE PORGIES.

2425. **Lethrinus rostratus** (Kuhl & Van Hass).

FAMILY KYPHOSIDÆ.—THE RUDDER-FISHES.

2426. **Kyphosus elegans** (Peters).

FAMILY SCIÆNIDÆ.—THE CROAKERS.

2427. **Grammistes sexlineatus** (Thunb.).

FAMILY CIRRHITIDÆ.—THE CIRRHIOIDS.

2428. **Paracirrhites forsteri** (Schneider).

2429. **Cirrhitus marmoratus** (Lacép.).

(This is the original spelling; not *Cirrhites* as generally written.)

FAMILY POMACENTRIDÆ.—THE DEMOISELLES.

2430. **Dascyllus trimaculatus** (Rüpp.).

2431. **Pomacentrus lividus** Bleeker.

2432. **Abudefduf sexatilis** (Linn.).

FAMILY LABRIDÆ.—THE LABROID FISHES.

2433. **Stethojulis albovittata** (Kölreuter).

2434. **Thalassoma dorsale** (Quoy & Gaim.).

2435. **Thalassoma lunare** (Linn.).

2436. **Thalassoma genivittata** (Cuv. & Val.).

2437. **Novaculichthys vanicorensis** (Quoy & Gaim.).

FAMILY SCARIDÆ.—THE PARROT-FISHES.

2438. **Scarus brighami.**[7] New species.

The head and fins of a large Scaroid were sent by Mr. Bryan. In several characters this fish differs from any other yet described, and seems to be a valid species.

[7] Named in honor of Wm. T. Brigham, Director of the Bernice Pauahi Bishop Museum.

D. x–10; A. ii–9. Two large white canines present on upper jaw above angle of mouth. Lips covering but little more than bases of the jaws, which are green; teeth white. Scales on cheeks in two series, the lower limb of the preoperculum being entirely naked. Scales of the lower series about .80 as large as those of upper series. Eye small, 10 in head. Distance between tip of jaw and eye a trifle less than 2 in head. Depth of head almost equal to length. Eye situated 2 of its diameters below upper profile of head. Profile of head boldly convex. Anterior nostril with a small membranaceous flap; posterior nostril twice as large as anterior and without flap.

Outer rays of caudal much elongated, about .66 longer than caudal proper; the other rays of the caudal form a double curve or scallop, the central rays being slightly longer than the rest; the free edge of the membrane is denticulate. Dorsal low, highest posteriorly; the eighth soft ray longest, 3 in head. Pectoral large, longest rays 1.50 in head. Length of anal 2.75 in length of dorsal. Anal highest posteriorly, longest ray 2.66 in head. Ventral small, second rays longest, 1.88 in head.

Color in alcohol: a faded yellowish green, becoming buff on throat. A broad, irregular, cream-colored band forms a rectangular figure on top of the head, the posterior part of the figure forming a broad band connecting the eyes; in this band are three small patches of the general green color, while the space enclosed within the figure is of the general color of the head. From the figure a streak passes below and beyond the eye for a short distance. Another short streak of the same color extends backward from the centre of the posterior margin of the eye. A broad cream-colored band starts below and anterior to the angle of the mouth, on either side, and passes to the edge of the lip; there it greatly narrows and follows the margin of the lip to the throat, but the two bands stop just before meeting. A cream-colored dot behind angle of mouth.

Dorsal slaty blue, with olive green margin. Caudal yellowish green with slaty blue longitudinal streaks. Anal similar to dorsal. Ventral pale cream color. Pectoral slate color, fading into yellowish green inferiorly. B. P. B. Mus. No. 2438 is the type.

FAMILY TEUTHIDIDÆ.—THE SURGEON-FISHES.

2439. **Teuthis atrimentatus** Jordan & Evermann.

2440. **Teuthis bipunctatus** (Günth.).

2441. **Teuthis striatus** (Quoy & Gaim.).

Twenty-one small specimens, ranging in length from 38 to 52 mm., and including colorless larvæ in the Acronurus stage, showing every gradation in color up to the dark, fully marked adults.

D. IX–26; A. III–26 or 27; P. 15; V. I–5. Head 3.50 to 4 in larvæ; 3.83 to 4.17 in adult, but usually 4; depth 2 in length without caudal; 2.33 in total length; eye 3 in head.

Body deep, much compressed, oval; profile convex. Mouth small, with 8 incisors on each side of jaw. Nostrils small, close together; the anterior one larger and with small fleshy flap. Spinous dorsal low, posterior soft rays highest, longest rays 2 in head. Anal low, highest posteriorly, longest rays about 1.75 in head; pectoral equals head; caudal forked; ventral about 2 in head. All fins very delicate, the tips breaking off in handling, so that it is difficult to give exact measurements. In none of the specimens was the caudal entire when received. Lateral line high, arched under third, fourth and fifth dorsal spines, then almost straight to middle of soft dorsal, where it descends abruptly to middle of caudal peduncle, a short distance anterior to caudal spine, then runs to tail along caudal peduncle by a sinuous course, curving above caudal spine.

Caudal spine small, 4.25 in head. Scales minute, ctenoid.

Color in alcohol: Larvæ a pale brown, belly and opercles silvery. A dark bluish band connecting the eyes, slightly posterior to them; a broad band of same color across caudal peduncle at base of fin. A dark ring around the mouth. A lighter band at base of dorsal, beginning at posterior portion of spinous dorsal and extending posteriorly to band on caudal peduncle. Other fins colorless. Adult: color of body varies from dark brown to very dark blackish brown, with from 9 to 11 straight light brown, longitudinal lines along sides of body, and a silvery sheen on the abdomen. Fins all black, except pectoral, which is bluish. Bands on larvæ are also present on adults, but become obscured or lost in those specimens that are almost black, with the exception of the ring about the mouth, which is always prominent.

2442. **Teuthis bishopi.**[8] New species.

D. IX–26; A. III–24. Depth 2.11 in total length; head 4.33 in total length, 3.75 without caudal; eye 5 in head, 3.90 in snout; snout 1.29 in head; interorbital 2.60 in head; caudal peduncle 2.40 in head. Pectoral slightly longer than head, 3.40 in length, without caudal.

Body deep, compressed, ovoid, upper profile much steeper than lower. Profile from base of dorsal to eye very slightly convex; from eye to tip of snout gently concave. Breast and belly, as far back as the anal fin, covered with cycloid scales, which also cover the entire head and extend over nape as far back as base of dorsal fin; remainder of body covered with ctenoid scales. Anterior nostril the larger, with small fleshy ring about it. Nine lobate incisors on each side of both upper and lower jaws. Caudal spine 4.50 in head; stout.

Origin of dorsal above base of pectoral; first dorsal spine imbedded in skin; posterior spine longest, 1.62 in head. Dorsal rays shorter than longest spine, from which they gradually descend to posterior ray, which is .25 of head. Anal highest in middle, slightly and uniformly curved; third anal spine .75 of longest anal rays. First anal spine very short, concealed in skin. Caudal broad, lunate, middle rays .66 of outer rays. Ventrals reaching beyond anus, to base of third anal spine.

Color in life: "Body like fresh pig skin; dorsal with blue and orange stripes."—Bryan.

In alcohol: uniform brownish slate color; lips chocolate color; breast gray; distal half of soft dorsal and anal fins blackish; ventral blackish; pectoral body color; caudal lighter than body and showing traces of a whitish marginal streak. B. P. B. Mus. No. 2442 is the type.

"An abundant fish about the island and much used as food by the Japanese there."—Bryan.

2443. **Teuthis achilles** (Shaw).

2444. **Teuthis triostegus** (Linn.).

A common species; much esteemed as food.

2445. **Zebrasoma flavescens** (Bennett).

[8] Named in honor of Hon. Charles Reed Bishop, founder of the Bernice Pauahi Bishop Museum.

Family SIGANIDÆ.

2446. **Siganus fuscescens** (Houttuyn).

Family BALISTIDÆ.—The Trigger-fishes.

2447. **Balistapus rectangulus** (Bloch & Schneider).

2448. **Balistapus aculeatus** (Linn.).

2449. **Melichthys bispinosus** Gilbert.

Very abundant at the island.

Family OSTRACIIDÆ.—The Trunk-fishes.

2450. **Ostracion tuberculatus** (Linn.).

2451. **Ostracion cornutus** (Linn.).

Family GOBIIDÆ.—The Gobies.

2452. **Gobius albo-punctatus** Cuv. & Val.

Family ECHENEIDIDÆ.—The Remoras.

2453. **Remora albescens** (Temm. & Schl.).

Family BLENNIIDÆ.—The Blennies.

2454. **Salarias gilberti.**[9] New species.

D. XII–19; A. 21; C. 13; P. 14; depth 5 without, 6 with caudal; head 4 without, 4.87 with caudal. Eye 4 to 4.50 in head. Head comparatively slender, breadth through cheeks .50 length. Mouth inferior, width of cleft .50 length of head. Teeth small, very numerous, finely pectinate. A triangular, simple tentacle above eye, its length greater than width of interorbital space; very small simple tentacle on nape; small palmately cleft tentacle over anterior nostril. Interorbital space grooved, its width .50 to .66 of eye. Maxillary extending to posterior margin of eye.

Dermal crest on head.

Dorsal fin deeply notched, rather high, its longest rays nearly equal to height of body. Posterior rays united to caudal. Anal membrane incised, rays with free tips, longest rays about .50 of

[9] In honor of Dr. Charles H. Gilbert, Department of Zoology, Leland Stanford Jr. University.

length of head. Caudal convex; pectoral somewhat rounded, about .90 of length of head. Ventrals 1.50 in head.

Head and body naked; lateral line arched to beyond tip of pectoral, where it descends to level of mouth and then extends backward to end of caudal peduncle.

Color in alcohol: blackish, somewhat streaked or mottled with brown. Fins black, except pectoral, which varies from black to pale in different specimens. B. P. B. Mus. No. 2454 is the type.

2455. **Salarias paulus.** New species.

D. XIII–20; A. 21; C. 15; P. 14. Depth 6.50 in total length; head 6 in total length, measuring from upper lip to tip of opercular flap; forehead protuberant; greatest length of head 5.66 in total length; eyes placed very high and far forward, 3.50 in head; cleft of mouth equals height of head, or .63 of length of head; cheeks bulging, breadth of head .81 of its length.

Lateral line high, commencing just above angle of opercular flap and describing an upward curve which extends to a point between the eighth and ninth dorsal spines, where it descends abruptly and ends below the twelfth spine, above the median line of the body. No scales.

Teeth small, pectinate, very numerous. Mouth inferior. Anterior profile strongly retreating.

No dermal crest on head. Posterior nostril inconspicuous; anterior nostril with dermal, fleshy flap prolonged into a four-cleft tentacle. Simple tentacle over eye, its length much less than width of interorbital space; very minute simple tentacle on nape, its length about .33 that of tentacle over eye. Maxillary extending slightly beyond posterior margin of eye.

Dorsal fin beginning above gill opening, notched, tips of soft rays free. Spinous dorsal of uniform height, lower than soft portion which is highest posteriorly; longest spine about .75 of longest ray, which is equal to greatest breadth of head.

Anal incised, slightly lower than soft dorsal. Uppermost rays of pectoral very short; tenth and eleventh rays longest, equal to length of head.

Color in alcohol: light brown; bluish on belly and under pectorals; body with seven faint transverse bands of darker brown, fading out below and posteriorly on caudal peduncle, so that in life

there may have been eight bands; each band has two conspicuous darker brown spots in it. Fins all pale brown; soft dorsal with a row of dark dots on each membrane between rays. A small dark brown line slightly below and back of eye.

This must have been a very beautiful fish in life. One specimen, 99 mm. long. B. P. B. Mus. No. 2455 is the type.

2456. **Salarias marcusi.** New species.

D. XII–21; A. 22; C. 13; P. 14. Depth equals length of head, 4.33 in length without caudal, 5.50 in total length. Eye 3.75 in head. Breadth of head 1.63 in its own length. Width of interorbital space 2 in eye. Mouth inferior, width of cleft .50 of length of head. Teeth very numerous, small, finely pectinate. Anterior profile of head convex. A small dermal crest on head; in one specimen its height is .50 width of interorbital space; in the other specimen it is merely a heavy keel; a small, simple tentacle over eye, its length equal to width of interorbital space; a much smaller simple tentacle on nape, its length somewhat more than .50 that of tentacle over eye; anterior nostril with a fleshy tube, the upper border of which is prolonged into a stout, but not lengthy, fringed tentacle.

Lateral line commences just above upper angle of opercular flap; curving upward it follows the dorsal outline from the fourth to the tenth dorsal spines, then curving obliquely to a point beyond tip of pectoral, it follows the median line of the body to the base of the caudal; tubes of lateral line disappear at about middle of soft dorsal, the remainder of the lateral line being marked by pores and depressions.

Origin of dorsal anterior to gill opening, the tip of opercle being under base of third dorsal spine. Dorsal deeply notched, spinous portion highest anteriorly; third and fourth spines longest, .80 of length of head and equal to highest soft rays; dorsal membrane incised, spines and rays with free tips, dorsal connected with caudal by a membrane. Anal membrane deeply incised, rays with free tips; fin much lower than dorsal, longest rays .50 length of head. Caudal convex; rays divided in posterior .66 of their length, the tips free. Pectoral somewhat rounded, tips of rays free, its length equal to that of head. Conspicuous mucus pores below and posterior to eye.

Color in alcohol: body brown, lighter on caudal peduncle, darker, almost black, on head, bluish white on belly. Color and markings greatly obscured by a blue film, which is probably coagulated mucus. Posterior third of body with three rows of very dark brown spots below the lateral line, and two rows above it. Each membrane of spinous dorsal with two vertical rows of dark brown spots. Soft dorsal with rows of dark brown dashes and dots running diagonally backwards on the membranes. Anal with three longitudinal rows of dark brown spots; free tips of rays whitish. Caudal and pectoral colorless.

Here described from two specimens, one 116 mm. long, the other 144 mm. long. B. P. B. Mus. No. 2456 is the type.

2457. **Entomacrodus gibbifrons** (Quoy & Gaim.).

2458. **Entomacrodus sealei.**[10] New species.

D. XII–16 or 17; A. 17; P. 13; C. 12; head 5 in total length; depth 6.75; eye equals caudal peduncle, 3.40 in head. Eye situated very high up; interorbital space narrow, .50 in eye. Mouth inferior, width of cleft .50 length of head. Teeth very minute, forming a comb-like band in each jaw; lower jaw with two small posterior canines. No crest on head; tentacles on nape very small and very close together, hardly as long as width of interorbital space; tentacle over eye comparatively stout, triangular, with two hair-like filaments on inner side of tentacle; length .66 diameter of eye; anterior nostril with fleshy tube, from upper side of which extends a stout tentacle, the upper half divided into five filaments.

Lateral line straight in anterior portion, curving downward beyond pectoral, and ending on median line, between spinous and soft dorsals.

Dorsals separate; spines of first dorsal almost uniform in height, last two or three somewhat lower than the others; spines about 2.50 in head; membrane incised about .66 of length of spines; base of soft dorsal shorter than that of spinous dorsal, fin ending at beginning of caudal peduncle; highest anteriorly, where rays are about .50 length of head; membrane incised deeply, leaving tips of rays free. Length of anal .33 of total length; rays of anal of uniform length, their height same as soft dorsal; mem-

[10] In honor of Mr. Alvin Seale, of the Bishop Museum staff.

brane incised, tips of rays free. Caudal truncate. Longest rays of pectoral equal to head.

Color in alcohol: pale brown, fading away to dull white on belly and under side of head; seven cross bands on sides of body; above the median line they are distinct, and appear as heavy dark spots; below the lateral line they are very faint and divide, forming two diverging bands. Two longitudinal rows of white dots above median line. Caudal with three irregular dark transverse bands. Head and upper half of body thickly sprinkled with fine black dots; upper part of membrane of spinous dorsal dark; soft dorsal with six dark diagonal bands, running backward. A wide dark band on margin of anal; free tips of anal rays white. Pectoral pale and colorless to naked eye; under lens the membrane appears thickly sprinkled with minute dark dots.

One specimen, 38 mm. long. B. P. B. Mus. No. 2458 is the type.

Family PSEUDOCHROMIDÆ.

2459. **Pseudogramma polyacanthus** Bleeker.

D. VII–18; A. III–16; lateral line tubes 29; scales in lateral series 50. Head 2.80 in total length without caudal, 3.33 including caudal. Depth of head at occiput .25 of length without caudal, .20 including caudal. Maxillary produced to posterior edge of eye. Eye 4 in head, distant .66 of its own diameter from tip of snout. Length of base of spinous dorsal 1.33 in base of soft dorsal.

A specimen in poor condition, 50 mm. in length, the caudal broken and most of the scales gone. It agrees very well in the main with Kner's description of *Pseudochromis polyacanthus* Bleeker (Neue Fische Mus. Godeffroy, October, 1867, 717), based on a specimen secured in the Viti Islands. But it is hardly the same fish that Bleeker described under the name *Pseudogramma polyacanthus* in "Sur la Famille des Pseudochromidoides et Revision de ses Espèces Insulindiennes", Verh. Ak., Amsterdam, 1875, p. 25, while Bleeker's text does not agree with his figure. Bleeker's description was based on a specimen from Ternate, in the East Indies, while Kner's specimen was from the South Pacific, and this specimen from Marcus Island would be more likely to agree with the latter than the former; it is possible that the Polynesian form is a different species from that of the East Indies, but they may be placed together until an abundance of good material is available.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—NO. 2.

Director's Report for 1903.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1904.

BOARD OF TRUSTEES.

MUSEUM STAFF.

REPORT.

AFTER a number of years, in which the collections in the Bernice Pauahi Bishop Museum have been subject to the utility of the whole rather than the convenience of any part, the plans of the Director have progressed to the extent of a complete separation and rearrangement of the Hawaiian portion of the collections by the opening and dedication of Hawaiian Hall. The foundations of this largest portion of the entire Museum building were laid five years ago, but the builders have at last completed their work and on the twenty-fourth of November, 1903, the Hall was publicly dedicated. It is the first distinctively Hawaiian museum in the world, and its opening certainly marks an epoch in the history of these Islands.

To facilitate the transfer of the Hawaiian specimens to their new cases the Trustees closed the Museum to the public from May 1 until the day of reopening, a little more than six months, and even with this help the last cases were not ready for their assigned exhibits until two days before the results were to be given to the public. The removal of so large a portion of our collection of course involved a very extensive rearrangement of the entire Museum, and nearly all exhibits were removed from their cases and after careful examination rearranged.

In the Picture Gallery all the pictures were taken from the walls and the room was repainted to the great advantage of the general effect. In Polynesian Hall two large cases were built to occupy the centre of the Hall, but even with this relief the cases are often too crowded to show their contents to the best advantage.

The entire collection of shells, numbering some 10,000 species and more than 40,000 specimens, was rearranged by Mr. J. F. G. Stokes in accordance with the best accepted views of modern conchologists, and the nomenclature brought up to date. This required a large number of new labels.

We were also able to place our collection of models of Pacific region canoes, which now numbers forty-five, in a case by itself. Even with all the Hawaiian specimens eliminated the cases of Polynesian Hall are too crowded, and this is especially the case with the New Guinea, Solomon Islands and Micronesian sections. The gallery of this Hall has long been insufficient to properly exhibit the Natural History of the non-Hawaiian Pacific. With our natural rate of increase the provision of additional accommodation in this department will soon be imperative.

As no part of this Museum had ever been dedicated it was thought best to have some simple recognition of the dedication to public instruction and amusement of so complete a collection of Hawaiian matters. Invitations were sent to those who were likely to be interested in the occasion, and on the afternoon of November 24th a large company assembled in Hawaiian Hall in response to these invitations. The Supreme Court of the Territory, the United States Court, most of the Protestant clergy, the faculties of Oahu and St. Louis Colleges and the Kamehameha Schools, and many other citizens were present and examined the new arrangements, which seemed to meet with general approval. At the request of the President of the Trustees, Ex-Governor Sanford B. Dole, the company came to order at four o'clock and listened to the following address from the Director:—

In welcoming you here this afternoon it has seemed good to Judge Dole, the President of the Board of Trustees, that I should take the opportunity afforded by this the only dedication this Museum has ever had, to explain so far as I may in a few minutes, how the institution is arranged and what it stands for. And first it stands as a monument of the generosity of that public spirited

citizen of Honolulu, Charles Reed Bishop, while designed as a memorial of his excellent and accomplished wife, Bernice Pauahi.

The original building was intended to contain and preserve simply the Hawaiian kahili, feather robes, pictures and various keepsakes belonging to his wife, who was heir to the Kamehamehas. With the exception of the feather work and kapa the the entire collection was contained in the room which now serves as a vestibule to the new Hawaiian Hall this day opened to the public. Scientific arrangement was impossible: scientific study had to be conducted elsewhere than in the small building. But the generosity of Mr. Bishop and the wisdom of the Trustees removed one by one all obstacles until today we have this grand instrumentality for the study of the ethnology and natural history, not only of these Islands but of the whole Pacific.

This Museum is no longer merely an exhibition to amuse an idle hour, but it is, or should be when perfected, a means of collecting, preserving and studying the history of life in the Pacific, a region where the original native life is fast disappearing as you see it is on this group. In a very few years it will be impossible to gather the necessary material for any such study: indeed, if the portion of this collection which was gathered half a century ago had not then been saved we should have little valuable knowledge of the ways and work of the Hawaiian people, and the same is true of every other group in this great ocean. The amusement of the people, or even their instruction, is not the chief object of a museum such as this, but we have carefully collected all these things and clustered about them all the facts we can obtain and then we correlate these facts with others collected by workers in the same field until at last we may wrest from the unknown the secrets which today puzzle the wisest scientists, such as whence and when did the Polynesians come into the waters of the great ocean? Was the relation of land to water always the same as now? Were the Hawaiians the first inhabitants of this group? Who carved the huge images of Easter Island? And many other problems of no light importance.

It is waste of time to speculate on most of these questions until we have collected all the witnesses, both living and dead that may be within our reach. That is why a museum like this is never completed, indeed is never finally arranged. If it ceases to grow

it dies, and its remains should be scattered to the four winds, that is, to enrich other living museums. That is why we are continually calling upon our Trustees for funds to purchase this or that, and to organize expeditions to collect objects and information. If in doing this our legitimate work we can also afford amusement and instruction to the public so much the better, but it should not be a one-side arrangement as it has been in the past. No museum in the world is sufficiently endowed to permit all the work that its staff would like to do, or have done; and in return for the amusement or instruction afforded it seems right that the public should do more than criticise. Many of you have specimens that should be in this Museum: they are of little value or use to you. Why not send them here where their intrinsic value is greatly increased by comparison with others of the same class? Many of you who have none of these things can easily aid the work of the Museum by subscribing for its publications, which may not be of especial interest to you, but the subscription helps to make them better, and the smallness of the edition will, in no distant time, make a set of considerable money value. Five dollars a year would secure all our publications as issued. [Here the Director referred to wants of the Museum which are mainly of local interest and may be omitted here.]

Now let me briefly tell you what we have done. We have separated the Hawaiian exhibit as the most extensive and important in our possession and placed the greater part of it in a hall where it is classified and arranged so that anyone can at once find what most interests him. The non-Hawaiian things are also placed by themselves, each group in a separate alcove. Then all these things that to the general visitor are simply "curios" become the objects of careful and patient study: they are photographed for publication in the printed results of such study and they are compared with similar objects in other museums or made by other peoples. For some eight years I did this work alone; now I have a staff of young men trained, hard-working, skilled and learned as you all may see by looking round at the results of their labors. The groups of Hawaiians presenting the work of former days: the model of the heiau, and of Kilauea: the fruits that are so true to nature, and the fish that have never been better exhibited in any museum all prove my statement. Are they not worthy of your

approbation and your help? In many countries common carriers take free all specimens coming to a large museum because they recognize the value in mere dollars and cents that such an institution is to a country, and the workers are freely carried over railroads and waterways. As we are so remote from other museums our publications become a very necessary means of communication, and today our exchanges go to most parts of the civilized world, and this Museum that has grown up in your midst for thirteen years almost unnoticed is today willingly accorded the first place in the class of local museums by all the museum authorities.

We are insatiable in our wants. We must have every plant, every coral, every fish, every bird, indeed, every natural or manufactured thing that will help in the study of this Pacific region. We are few in numbers and you must help us as some of the younger men in the schools are now doing, and in return we will show you beauties of nature you never noticed before. In the gallery of Hawaiian Hall will gradually grow an aviary where you can see at a glance the life history of our Hawaiian birds, and in that same way we hope to treat other classes of the children of Nature.

The handbook will help in finding things wanted, but I should feel obliged to apologise for the absence of many needed labels did I not know that there are already labels enough to occupy your attention in many visits, at least until our printer can complete the work. But I will spare your ears and leave you to the more pleasing exercise of your eyes.

This closed the formal proceedings, and the remainder of the afternoon was spent in inspecting the halls. On the following Friday public open days were resumed. On the 25th November the Director left on the Sonoma for a vacation in the Colonies, and as a result of that journey many choice ethnological and zoological specimens were brought to the Museum.

Of the special results of the year's work may be mentioned several fine groups of birds by Mr. W. A. Bryan, who also completed a model of Kilauea crater on a scale of 130 feet to the inch. Mr. Stokes has completed his elaborate and accurate model of an ancient Hawaiian temple.

During the year Mr. Seale, who had been collecting for two years in the southeast and western Pacific was recalled by the Trustees, and the results of his work will be described later. Since his return he has been occupied with the determination of the fishes of his collecting.

As Mr. Stokes was appointed Curator of Polynesian Ethnology, Mr. Blackman has taken the considerable responsibility of caring for the Library which has grown during the year (as will be seen by the list appended of accessions) and been transferred to the new cases in the upper gallery of Hawaiian Hall. Mr. C. M. Cooke, Jr., has been busily studying and collecting Hawaiian land shells until his specimens number many thousands. We hope soon to resume experiments (interrupted by the installation of the new hall) as to the best method of illustrating the minute shells of *Tornatellina* and similar genera. We hope to publish more of Mr. Cooke's results before the end of another year.

Mr. John J. Greene has continued with the Printing Department and, beside very many labels, has printed the last report (1902) and a handbook to the Museum which is intended not only to replace the former catalogue, now long out of print, but also to serve as guide through the halls and as an illustrated remembrancer of a visit to the Bishop Museum. The high standard of the Museum Press has been fully maintained. At the request of many students the Trustees authorized the publication of the original descriptions of Hawaiian land shells, especially of the genus *Achatinella* so far as they could be collected, and Mr. E. W. Thwing has edited these with notes and the printing has begun.

At the first of the year Mr. Ralph C. Geer, our cabinet maker and "generally handy man" resigned and his place has not been filled, nor will it be easy to fill it. Every museum director knows how valuable in museum work a thoroughly competent carpenter is, and the hundreds of stands and supports for specimens always

needed can be much better made by one who is in touch with the museum work than by outside assistance.

Mr. J. W. Thompson has continued his casts of fishes, but his work was unfortunately interrupted to make similar fish casts for the Hawaiian exhibit at St. Louis. Since this exhibit has been given up from lack of funds, the three months work of Mr. Thompson is a loss so far as the Museum is concerned.

To our staff has been added a lady assistant to preside on public days in Hawaiian Hall and take charge of the sales of the handbook and other publications of the Museum. Another of the quarto memoirs of the Museum series, "The Mat and Basketry of the Old Hawaiians," is ready and will soon be put to press.

TABLE OF ATTENDANCE.

1903.	Whites.	Hawaiians.	Portuguese.	Chinese.	Japanese.	Others.	Open on		Visitors on closed days.	Average Attendance.		Total Visitors.
							Public days.	Other days.		Public days.	Other days.	
January	277	142	28	225	89	......	10	3	18	74	6	761
February	266	79	26	45	86	1	8	5	45	57	9	503
March	356	91	36	129	132	1	8	7	56	86	8	745
April	338	152	41	137	127	2	8	7	87	88.3	12.4	797
May	46	......	......	......	......	......	......	4	46	......	11	46
June	25	......	......	......	......	......	......	4	25	......	6	25
July	70	......	......	......	......	......	......	14	70	......	5	70
August	11	......	......	......	......	......	......	3	11	......	4	11
September	18	......	......	......	......	......	......	6	18	......	3	18
October	85	......	......	......	......	......	......	12	85	......	7	85
November	415	261	21	114	23	......	3	6	30	268	5	834
December	446	742	66	234	111	......	7	4	25	225	6	1599
Totals	2353	.1467	218	884	568	4	44	75	516	125	6.9	5494

List of Accessions.

DEPARTMENT OF ETHNOLOGY.

Gifts.

6225 Runners of Hawaiian sled, from Col. W. H. Cornwell, Maui.
6256 Grindstone. Hawaii. From Mr. David Rice.
6259 Stone idol, unfinished. Oahu. From Mr. A. F. Judd.
6263 Rope of twisted human hair. H. I. From Mr. G. P. Wilder.
6264 Braided human hair. H. I. Ibid.
6265 Coir for binding canoe outriggers. H. I. Ibid.
6266 Fish hook of shell. H. I. Ibid.
6267-8 Poi pounders. H. I. Ibid.
6269 Stone lamp. H. I. Ibid.
6270 Stone hammer. H. I. Ibid.
6271 Stone adze. H. I. Ibid.
6272-8 Squid hook sinkers. H. I. Ibid.
6279-80 Ulumaika. H. I. Ibid.
6285 Stone god. H. I. Ibid.
6299-6300 Tapa. Rarotonga. From Col. and Mrs. Gedgeon.
6304 Tapa. Niuë. From Mr. and Mrs. Kahn.
6305 Tapa jacket. Mangaia. Ibid.
6306-7 Garment, parts of. Mangaia. Ibid.
6308 Tapa mask. Mangaia. Ibid.
6368 Fishing rod and line. Oahu. From Mr. A. K. Williams.
6369 Fish broom. Oahu. Ibid.
6379 Spherical stone mortar. Hawaii. From Mr. C. M. Walton.
6380 Konane stone. Hawaii. Ibid.
6381 Tobacco pipe. Hawaii. From Mr. S. Andrews.
8243 Clay pot. Bougainville, Solomon Ids. From Mrs. Tindall.
8275-80 Hats. Bougainville, S. I. Ibid.
8282 Basket. Bougainville, S. I. Ibid.
8284-6 Armlets. Bougainville, S. I. Ibid.
8288 Armlets. Choiseul, S. I. Ibid.
8293 Fishing net. Choiseul, S. I. Ibid.
8298 Netted bag. Choiseul, S. I. Ibid.
8312-4 Baskets. Rubiana, S. I. Ibid.

8348-50 Bands of Tridacna shell. Choiseul, S. I. Ibid.
8352 Neck ornament. Choiseul, S. I. Ibid.
8367 Canoe god. Choiseul, S. I. Ibid.
8397 Stone headed club. New Guinea. Ibid.
8499 Spear. Shortland, S. I. Ibid.
8597-8 Spear. Bougainville, S. I. Ibid.
9599 Sheaf of arrows. Bougainville, S. I. Ibid.
9600 Bow. Bougainville, S. I. Ibid.
8255-6 Clay pots. Espiritu Santo, N. H. From Mr. W. L. Bell.
8267 Tapa. Solomon Ids. From Mr. W. H. Whiteman.
8317 Dancing dress. Shortland, S. I. From King Weri.
8497 Bow. Shortland, S. I. Ibid.
8498 Spear. Shortland, S. I. Ibid.
8318 Dancing dress. Shortland, S. I. From Chief Muli.
8356 Human hair. Florida, S. I. From Mr. Woodford.
8397 Dress. Gilbert Ids. From Mrs. Tanner.
8429 Dancing cloak. Admiralty Ids. From Mr. Smith.
8430 Necklace of Cypræa. Admiralty Ids. Ibid.
8431 Small bag. Admiralty Ids. Ibid.
8432-3 Pair bead ornaments. Admiralty Ids. Ibid.
8434-5 Pair arm rings. Admiralty Ids. Ibid.
8436-8 Lime spoons. Admiralty Ids. Ibid.
8449-50 Dresses. New Hebrides. From Miss Robinson.
8508 Spear. Bougainville, S. I. From Dominica.

Collected.

6287-92 Skulls. ?
6293 Piece of tapa. ?
6294-95 Adze heads. Rarotonga.
6296-7 Adze heads. Bolabola.
6298-6300 Tapa. Rarotonga.
6301 Tapa. Aitutaki.
6302 Bag, of pandanus. Rarotonga.
6303 Colored fibre for mat borders. Tongareva.
6309 Tapa. ?
6310 Mat, pandanus. Tongareva.
6311 Mat, pandanus. Tahiti.
6312-13 Hatbands of split bambu. ?
6314-17 Necklaces of Partula shells.

8201 Canoe. Shortland, S. I.
8202-14 Paddles, with No. 8201. Shortland, S. I.
8215-16 Paddles. Bouka, S. I.
8217-18 Canoe and paddle. Guadalcanar, S. I.
8219-20 Paddles. Florida, S. I.
8221-41 Water bottles. Shortland, S. I.
8242 Coconut. Ibid.
8244-45 Clay pot. Ibid.
8246 Clay pot. Bougainville, S. I.
8247-54 Clay pot. Shortland, S. I.
8255-56 Clay pot. Espiritu Santo, N. H.
8257-66 Tapa. Malaita.
8267 Tapa. Solomon Ids.
8268 Tapa. Mangaia, Hervey Ids.
8269-70 Tapa. Rarotonga.
8271-4 Mats. Shortland, S. I.
8281 Basket. Bougainville, S. I.
8283 Armlet. Bougainville, S. I.
8287 Dyed grass, for armlets. Solomon Ids.
8289-92 Mourning belts. Shortland, S. I.
8294 Shuttle and unfinished net. Ibid.
8295 Fibre. Ibid.
8296-97 Netted bag. Bougainville, S. I.
8298-99 Netted bag. Choiseul, S. I.
8300 Rattan worn round the body. ? Bougainville, S. I.
8301 Netted bag. Bougainville, S. I.
8302-3 Basket of plaited coconut leaves. Shortland, S. I.
8304-5 Fans. Ibid.
8306-11 "Devil" sticks. Ibid.
8315 Shield. Rubiana, S. I.
8316 Pubic ornament of women. Shortland, S. I.
8319 Pair bead armlets. Shortland, S. I.
8320 Eye shade. Florida, S. I.
8321-2 Woman's dress. Guadalcanar, S. I.
8323 Bag of hibiscus fibre. Ibid.
8324 Dancing rattle. Ibid.
8325 Plume of colored grass. Ibid.
8326 Roll of ornamented split rattan. Ibid.
8327 Plaited armlets, pair. Ibid.

8328 Bambu comb. Ibid.
8329 Comb. Ibid.
8330 Small fish net. Ibid.
8331 Food bowl. Ibid.
8332 Lime box. Shortland, S. I.
8333 Lime box. Simbo, S. I.
8334-8 Lime box. Bougainville, S. I.
8339-41 Lime box. Guadalcanar, S. I.
8342 Medicine box. Shortland, S. I.
8343-5 Arm rings, from Tridacna shell. Ibid.
8346-7 Cores of shell from which rings have been cut. Ibid.
8348-50 Bands of Tridacna shell. Choiseul, S. I.
8351 Neck ornament of shell. Ibid.
8353 Shell (Cardium) for scraping. Ibid.
8354 Flints, for drill tips. Florida, S. I.
8355 Hammer for cracking nuts. Choiseul, S. I.
8357 Seed. Shortland, S. I.
8358-9 Fish hooks. Guadalcanar, S. I.
8360 Stone hammer. Choiseul, S. I.
8361-4 Canoe gods. Shortland, S. I.
8365-6 Canoe gods. Choiseul, S. I.
8368 Personal god. Guadalcanar, S. I.
8369 God of canoe house. Shortland, S. I.
8370-1 Wooden mortars. Ibid.
8372-3 Combs. Ibid.
8374-5 Scrapers for copra. Ibid.
8376 Sago breaker. Ibid.
8377-8 Markers of pottery. Ibid.
8379 Round stone, for pot making. Ibid.
8380-2 Strings of shell money. Ibid.
8383-4 Strings of shell money. Guadalcanar, S. I.
8385 Pandean pipe. Solomon Ids.
8386-90 Pandean pipes. Shortland, S. I.
8391-2 Rasps. Ibid.
8393 Neck ornament. Ibid.
8394-5 Strings of seed beads. Bougainville, S. I.
8396 Poi pounder. Mangaia.
8399-8400 Fighting spears. Choiseul, S. I.
8401-10 Adze heads. Shortland, S. I.

8411-19 Adze heads. Choiseul, S. I.
8420 Adze heads. Guadalcanar, S. I.
8421 Adze heads. Samoa.
8422-6 War clubs. Choiseul, S. I.
8427-8 Baskets. Bougainville, S. I.
8429 Dancing cloak. Admiralty Ids.
8481 Fish arrows (10 and sheath). Shortland, S. I.
8482 Arrows (6). Shortland, S. I.
8483 Arrow. Bougainville, S. I.
8484-94 Bows. Bougainville, S. I.
8495-7 Bows. Shortland, S. I.
8500 Spear. Shortland, S. I.
8501 Spear. Guadalcanar, S. I.
8502-7 Spears. Choiseul, S. I.
8508-39 Spears. Bougainville, S. I.
9540-92 Spears. Bougainville, S. I.
9593 Chief's club. Shortland, S. I.
9594 Ear ring. Guadalcanar, S. I.
9595 Mat. Shortland, S. I.

Purchased, except where otherwise mentioned.

6206 Female figure, wood. Rapanui.
6207-8 Wooden paddles. Solomon Ids.
6209-10 Spears. ?
6211 Idol. New Guinea.
6226 Cast of Hawaiian stone idol. Loaned by W. T. Brigham.
6243-6 Seed necklaces. Hawaiian Ids.
6249-55 Seed necklaces. Hawaiian Ids.
6260 Stone mirror. Kauai.
6261 Stone cup. Hawaiian Ids.

Exchanged.

6221-2 Casts of inscribed tablets. Rapanui.
6223 Samples of tapa and photos.
6370 Heitiki of human bone. New Zealand.
6371 Heitiki made from sperm whale jaw bone. New Zealand.
6378 Dilly basket. Queensland.

RELICS AND ECONOMIC PRODUCTS.

6212 Section of Vancouver-Fanning cable. Given by Mrs. A. L. Ahlo.

6224 Section of Oahu-Molokai cable. Given by Mr. S. M. Damon.

6257 Section of San Francisco-Honolulu cable, shore end. Given.

6258 Section of San Francisco-Honolulu cable, deep sea. Given.

6321 Cocoons of silk worm grown in Kona, Hawaii. Given by the Kona Echo.

6357 Royal standard of Kalakaua. Given by the Republic of Hawaii.

6358 Embroidered coat of arms of Hawaii. Ibid.

6359 Helmet. Ibid.

6360 Flag of Hale Naua. Loaned by the Territory of Hawaii.

6362-3 Wooden bowls turned from Hawaiian wood. Given by Mrs. W. F. Allen.

6364 Star-shaped brooch. Ibid.

Section of trunk of tamarind tree planted in Mrs. Bishop's garden on the day of her birth.

ORNITHOLOGY.

Collected, except where otherwise mentioned.

2208-11 Group of Anas wyvilliana Scl., 2 ad., 2 juv. Oahu. Given by Mr. G. P. Wilder.

2212-13 Nycticorax nycticorax nævius (Bodd.), 1 ♂, 1 ?. Oahu. Ibid.

2214 Phaethon lepturus Lacép. & Daun. Hawaiian Ids. Ibid.

2215 Gallinula sandvicensis Streets. H. I. Ibid.

2216 Fulica alai Peale. H. I. Ibid.

2217 Dafila acuta Linn. H. I. Ibid.

2218 Plegadis guarauna (Linn.). H. I. Ibid.

2219 Arenaria interpres (Linn.). H. I. Ibid.

2220 Heteractitis incanus (Gmel.). H. I. Ibid.

2221 Nettion carolinensis (Gmel.), ♂. Maui. Ibid.

2222 Spatula clypeata (Linn.), ♂. Maui. Ibid.

2223 Charitonetta albeola (Linn.) ♀. Maui. Ibid.

2224 Actodromas maculata (Vieill.). Oahu. Ibid.

2225 Oxyechus vocifera Linn. Oahu. Ibid.

2226 Charadrius dominicus fulvus (Gmel.). H. I. Ibid.
2227 Gallinago delicata (Ord.). H. I. Ibid.
2228 Calidris arenaria (Linn.). Maui. Ibid.
2229 Numenius tahitiensis (Gmel.). H. I. Ibid.
2230 Microanous hawaiiensis Roths. H. I. Ibid.
2231-2 Diomedea immutabilis Roths., eggs. H. I. Ibid.
2400 Globicera auroræ (Peale), ♀. Tahiti, Society Ids.
2401-7 Ptilopus purpuratus (Gmel.), ♂ & ♀. Tahiti.
2408-11 Todirhamphus veneratus (Gmel.), ♂ & ♀. Tahiti.
2412 Demiegretta sacra (Gmel.), ♂. Huahine.
2413-15 Butorides stagnatilis (Gould), ♂ & ♀. Tahiti.
2416-18 Anas superciliosa Gmel., ♂ & ♀. Ibid.
2419 Urodynamis taitensis (Sparrm.). Ibid.
2420 Acrocephalus sp., ♂. Ibid.
2421 Hirundo tahitica Gmel., ♂. Ibid.
2422 Pomarea nigra (Sparrm.). Ibid.
2423 Aegintha temporalis Lath., ♂. Ibid.
2424 Sterna bergii Licht., ♀. Ibid.
2425 Gygis alba (Sparrm.). Ibid.
2426-7 Heteractitis incanus (Gmel.), ♂ & ?. Ibid.
2428-30 Charadrius dominicus fulvus (Gmel.), ♂ & ♀. Ibid.
2431 Ptilopus purpuratus (Gmel.), nest and egg. Ibid.
2432-4 Todirhamphus tutus (Gmel.), ♂ & ♀. Raiatea.
2435-40 Ptilopus chrysogaster Gray, ♂ & ♀. Ibid.
2441-2 Charadrius dominicus fulvus (Gmel.), ♂ & ♀. Ibid.
2443 Heteractitis incanus (Gmel.), ♀. Ibid.
2444-7 Anas superciliosa Gmel., ♂ & ♀. Ibid.
2448-9 Sterna bergii Licht., ♀. Ibid.
2450 Phaethon lepturus Lacép. & Daun., ♀. Ibid.
2451-4 Urodynamis taitensis (Sparrm.), ♂ & ♀. Rarotonga.
2455-8 Globicera sp., ♂ & ♀. Ibid.
2459-60 Ptilopus rarotongensis H. & F. Ibid.
2461-9 Aplonis cinerascens H. & F., ♂ & ♀. Ibid.
2470 Anas superciliosa Gmel., ♀. Ibid.
2471-2 Charadrius dominicus fulvus (Gmel.), ♂ & ♀. Ibid.
2473 Heteractitis incanus (Gmel.) ♀. Ibid.
2474-6 Monarcha dimidiata H. & F., ♂ & ♀. Ibid.
2477, 2479 Anous stolidus (Linn.), ♂ & ♀. Ibid.
2478 Gygis alba (Sparrm.), ♂. Ibid.

2480-1 Demiegretta sacra (Gmel.), ♀. Ibid.
2482-3 Globicera sp., ♂ & ♀. Ibid.
2484-7 Coriphilus taitianus (Gmel.), ♂ & ♀. Bolabola.
2488-2503 Puffinus chlororhynchus Less., ♂, ♀, nests and eggs. Bolabola.
2504 Chenopis atrata Lath., ♂. Honolulu. Given by Mrs. Foster.
2505-11 Ptilopus grayi Bp., ♂ & ♀. Fate, New Hebrides.
2512-15 Chalcophaps chrysochroa Gould, ♂ & ♀. Ibid.
2516-19 Macropygia rufa Ramsay, ♂ & ♀. Ibid.
2520-2 Sylphitreron tannensis (Lath.), ♂. Ibid.
2523-4 Columba leopoldi (Trist.), ♂ & ♀. Ibid.
2525 Globicera pacifica (Gmel.), ♀. Ibid.
2526-30 Trichoglossus messena Bp., ♀ & ♂. Ibid.
2531 Demiegretta sacra (Gmel.), ♀. Ibid.
2532 Sterna bergii Lath., ♂. Ibid.
2533 Porphyrio smaragdinus Temm., ♂. Ibid.
2534 Megapodius layardi Trist., ♂. Ibid.
2535 Hypotænidia philippensis (Linn.), ♂. Ibid.
2536, 2537 Pachycephala chlorura Gray, ♂ & ♀. Ibid.
2538 Halcyon juliæ Heine, ♀. Ibid.
2539 Merula mareensis Lay. & Trist., ♂. Ibid.
2540, 2541 Cacomantis schistaceigularis Sharpe, ♀. Ibid.
2542-4, 2547 Myzomela cardinalis (Gmel.), ♂ & ♀. Ibid.
2545, 2546 Zosterops flavifrons (Lath.), ♂ & ♀. Ibid.
2548 Erythrura cyaneifrons Lay, ♂. Ibid.
2549-50 Rhipidura sp., ♂ & ?. Ibid.
2551 Glyciphila flavotincta (Gmel.), ♂. Ibid.
2552-7 Lalage sp., ♂ & ♀. Ibid.
2558-63 Myiagra melanura Gray, ♂ & ♀. Ibid.
2564 Collocalia uropygalis Gray, ♀. Ibid.
2565 C. leucophæa Peale. Ibid.
2566-7 Sterna bergii Licht., ♂. Solomon Ids.
2568 Demiegretta sacra (Gmel.). Ibid.
2569 Erythrophoyx woodfordi (Grant), ♀. Ibid.
2570 Sula sula (Linn.). Ibid.
2571 Orthorhamphus magnirostris (Vieill.), ♀. Ibid.
2572 Tringoides hypoleucus (Linn.). Ibid.
2573, 2574 Porphyrio sp., ♀ & ? Ibid.

2575, 2576 Megapodius eremita Hartl., ♂. Ibid.
2577-81 Mino kreffti (Scl.), ♂. Ibid.
2582 Macrocorax sp., ♀. Ibid.
2583-6 Astur rufoschistaceus Roths. & Hartert, ♂ & ♀. Ibid.
2587 Pandion leucocephalus Gould. Ibid.
2588-9, 2591 Haliastur girrenera Vieill. & Oud., ♂ & ♀. Ibid.
2590 Rhytidocerus plicatus (Forst.), ♂. Ibid.
2592-3 Calornis metallica (Temm.), ♂. Ibid.
2594-5 C. flavipennis Homb. & Jacq., ♂ & ♀. Ibid.
2596-7 C. cantoroides Gray, ♀. Ibid.
Collection of Hawaiian birds, loaned by Prof. H. W. Henshaw.
Nest and egg of Loxioides baillieui. Purchased. Hawaii.
Mounted bear's head. Given by Dr. W. J. Galbraith.

ICHTHYOLOGY.

6214 Collection of Hawaiian fishes given by the U. S. Commission for Fish and Fisheries, and catalogued in this department as follows:

1685 Carcharias phorcys. Honolulu. (Co-type.)
1686 Gymnothorax thalassopterus. Honolulu. (Co-type.)
1687 Hippocampus fisheri. Hilo. (Co-type.)
1688 Myripristis berndti. Honolulu. (Co-type.)
1689 M. chryseres. Honolulu. (Co-type.)
1690 M. argyromus. Honolulu. (Co-type.)
1691 Flammeo scythrops. Honolulu. (Co-type.)
1692 Holocentrus zapyrus. Honolulu. (Co-type.)
1693 H. ensifer. Honolulu. (Co-type.)
1694 Apogon snyderi. Hilo. (Co-type.)
1695 A. snyderi. Hilo. (Co-type.)
1696 Hemipteronotus baldwini. Honolulu. (Co-type.)
1697 H. baldwini. Honolulu. (Co-type.)
1698 Scorpænopsis catocala. Honolulu. (Co-type.)
1699 Gnatholepis knighti. Hilo. (Co-type.)
1700 Vitraria clarescens. Hilo. (Co-type.)
1701 Etelis evurus. Hilo. (Co-type.)
1702 Mulloides flammeus. Honolulu. (Co-type.)
1703 Pseudupeneus chrysonemus. Hilo. (Co-type.)
1704 Upeneus arge. Honolulu. (Co-type.)

1705 Pomacentrus jenkinsi. Hilo. (Co-type.)
1706 Lepidoplois strophodes. Honolulu. (Co-type.)
1707 Teuthis atrimentatus. Honolulu. (Co-type.)
1708 Quisquilius eugenius. Honolulu. (Co-type.)
1711 Pseudupeneus multifasciatus. Honolulu.
1712 Holocentrus zapyrus. Ibid.
1713 Holocentrus zapyrus. Ibid.
1714 H. xantherythrus. Ibid.
1715 Mulloides auriflamma. Ibid.
1716 Gymnothorax laysanus. Ibid.
1717 Gobius albopunctatus. Ibid.
1718 Eviota epiphanes. Ibid.
1719 Teuthis dussumieri. Ibid.
1720 Callicanitus lituratus. Ibid.
1721 Pseudupeneus bifasciatus. Ibid.
1722 P. pleurostigma. Ibid.
1723 P. porphyreus. Ibid.
1724 Chætodon lunula. Ibid.
1725 Congerellus bowersi. Ibid.
1726-7 Pseudupeneus multifasciatus. Ibid.
1728 Apogon snyderi. Ibid.
1729 Holotrachys lima. Ibid.
1730 Gomphosus tricolor. Ibid.
1731 Holocentrus diadema. Ibid.
1732 Malacanthus parvipinnis. Ibid.
1733 Paracirrhites fosteri. Ibid.
1734 Synodus varius. Ibid.
1735 Glyphisodon sordidus. Ibid.
1736 Anampses cuvieri. Ibid.
1737-9 Trachurops crumenopthalmus. Ibid.
1740 Kuhlia malo. Ibid.
1741 Tropidichthys jactator. Ibid.
1742-6 Fistularia jetimba. Ibid.
1747 Novaculichthys hemisphærium. Ibid.
1748 Priacanthus cruentatus. Ibid.
1749-51 Mulloides samoensis. Ibid.
1752-5 Thalassoma duperreyi. Ibid.
1756 Julis eydouxii. Ibid.
1757 Teuthis sandvicensis. Ibid.

1758 Iniistius verater. Ibid.
1759 Ophicephalus striatus. Ibid.
1760 Thalassoma baillieui. Ibid.
1761-4 Hyporhamphus pacificus. Ibid.
1765-6 Sicopterus stimsoni. Ibid.
1767 Eteliscus marshi. Ibid.
1768-71 Awaous genivittatus. Ibid.
1772-6 Saurida gracilis. Ibid.
1777-9 Sebastapistes baillieui. Ibid.
1780-1 Teuthis bipunctatus. Ibid.
1782 Gobius albopunctatus. Ibid.
1783-4 Chætodon satifer. Ibid.
1785 Hemichoris roseus. Ibid.
1786 Chætodon lunula. Ibid.
1787 Anampses cuvieri. Ibid.
1788 Apogon maculiferus. Ibid.
1789 Zebrasoma hypselopterum. Ibid.
1790 Belone platyura. Ibid.
1791 Iniistius pavonimus. Ibid.
1792-5 Eutrumeus micropus. Ibid.
1796 Cirrhites marmoratus. Ibid.
1797 Flammeo sammara. Ibid.
1798 Cephalacanthus orientalis. Ibid.
1799 Apogon maculiferus. Ibid.
1800 Cheilio inermis. Ibid.
1801 Teuthis achilles. Ibid.
1802 Vitraria clarescens. Ibid.
1803 Carassius auratus. Ibid.
1804-5 Julis pulcherrima. Ibid.
1806-8 Paracirrhites cinctus. Ibid.
1809 Platophrys mancus. Ibid.
1810-11 Sebastapistes coniorta. Ibid.
1812-14 Aprion virescens. Ibid.
1815-19 Polydactylus sexfilis. Ibid.
1820-1 Paracirrhites arcatus. Ibid.
1822-4 Cheilinus bimaculatus. Ibid.
1825 Mugil cephalus. Ibid.
1826-7 Caraggus laxus. Ibid.
1828-30 Anacanthus meeki. Ibid.

1831 Flammeo scythrops. Ibid.
1832 Upeneus arge. Ibid.
1833 Calotomus sandvicensis. Ibid.
1834 Myripristis multiradiatus. Ibid.
1835 Cheilio inermis. Ibid.
1836 Eliotris sandwichensis. Ibid.
1837-9 Chætodon miliaris. Ibid.
1840 Zanclus canescens. Ibid.
1841 Enypnias desquamatus. Ibid.
1842 Sebastopsis guamensis. Ibid.
1843 Anchovia purpurea. Ibid.
1844 Atherina insularum. Ibid.
1845 Sebastapistes galactacme. Ibid.
1846-8 Gnatholepis knighti. Ibid.
1849-50 Tripterygion atriceps. Ibid.
6286 Collection of fishes from Japan given by the Leland Stanford Jr. University, and catalogued as follows: 35 species, 42 localities, 827 specimens.
6319 Collection of fishes made by Mr. Seale in the Society Ids.
9601 Collection of fishes made by Mr. Seale in the Solomon Ids.
9602 Collection of fishes made by Mr. Seale in the New Hebrides.

MOLLUSCA.

19,000 specimens of Achatinellidæ and Auriculidæ collected by Mr. Cooke on Kauai, Oahu and Maui.

Collection of shells made on Hawaii. Given by Prof. H. W. Henshaw.

Pearl shells. Pearl Harbor. Given by John W. Thompson.

Collection made in Tahiti by Mr. Seale.

MISCELLANEOUS.

Crustacea, 80 specimens, 33 species from Australia. Acquired by exchange.

Sponges, 64 specimens, 58 species from Australia. Acquired by exchange.

Skin of Crocodilus porosus Schu., from Queensland. Acquired by exchange.

Two sections of trunk of Bougainvillea, from Mrs. Bishop's garden. Given by the Trustees.

Section of trunk of Mango. Given by Mrs. Hans Isenberg.

Section of trunk of Pride of India. Given by Mrs. Hans Isenberg.

Alligator, mounted. Given by Dr. W. J. Galbraith.

LIST OF ADDITIONS TO THE LIBRARY.

Those received by exchange are denoted by an asterisk.

*Academy of Natural Sciences of Philadelphia.—Proceedings, vol. liv, parts 2 and 3; vol. lv, parts 1 and 2.—Journal, vol. xii, parts 1-3.—Annual Reports for 1901 and 1902.

Alcock, A.—A Naturalist in Indian Seas. London, 1902.

American Anthropologist, vol. v, nos. 1-3.

*American Museum of Natural History.—Bulletin, vol. xvi.—Memoirs, vols. iv and v.—Annual Report for 1902.

*American Philosophical Society.—Proceedings, vol. xli, nos. 171 and 172; vol. xlii, no. 173.

Anatomy and Physiology, Journal of.—Vol. xxxvi, part 3; vol. xxxvii, parts 1-4; vol. xxxviii, part 1.

Anderson, Tempest.—Volcanic Studies. London, 1903.

Annandale, Nelson and Robinson, Herbert C.—Fasciculi Malayenses, Anthropology, vol. i; Zoology, vol. 1. London, 1903.

*Anthropological Institute of Great Britain and Ireland.—Journal, vol. xxxi, 1901; vol. xxxii, July-December, 1902; vol. xxxiii, January-June, 1903.

*Anthropologie de Paris, Revue de l'Ecole d'.—Parts 1-12, 1902.

*Anthropologie de Paris, Société d'.—Bulletins and Memoirs, fasc. 3-6. 1902.

Asiatic Histories in the University Libraries, A Finding-list of Books on Modern.

*Asiatic Society of Bengal.—Proceedings, 1902, nos. 6-11; 1903, nos. 1-5.—Journal, Title page and Index, 1894-1901; vol. lxxii, part 2, nos. 1 and 2; part 3, no. 1.

*Australian Museum.—Records, vol. iv, no. 8; vol. v, no. 1.—Memoirs, vol. iv, part 6.—Report for 1901.—Nests and Eggs of Birds in Australia and Tasmania, part 3.

Avebury, Lord.—Origin of Civilization and the Primitive Condition of Man. London, 1902.

van Beneden and Gervais, Paul.—Ostéographie des Cétacés vivants et fossiles, 2 vols. Paris, 1868-79.

Bishop, Mrs. C. R.—Album of Photographs obtained by Mrs. Bishop during a visit to Italy. Given by Mrs. W. F. Allen.

Boston International Exhibition.—Catalogue of the Products of Salvador. Given by W. T. Brigham, Esq.

*Boston Public Library.—Annual List of New Books, 1901-2.—Fifty-first Annual Report, 1902-3.—Monthly Bulletins.

*Boston Society of Natural History.—Proceedings, vol. xxx, nos. 3-7; vol. xxxi, no. 1.—Memoirs, vol. v, nos. 8 and 9.

Branner, J. C.—Notes on the Geology of the Hawaiian Islands. Given by W. T. Brigham, Esq.

British Museum.—Catalogue of the Madreporarian Corals in the Museum, vol. iv, part 1.—Catalogue of the Collection of Birds' Eggs in the Museum, vol. iii.

*Brooklyn Institute of Arts and Sciences.—Bulletin, vol. i, nos. 2 and 3.—Cold Spring Harbor Monographs, 1 and 2.

*California Academy of Sciences.—Proceedings.—Geology, vol. ii, no. 1.—Physiology, vol. i, no. 3.—Mathematics and Physics, vol. i, no. 8.—Zoology, vol. iii, nos. 5 and 6.—Memoirs, vol. iii.

Cambridge Anthropological Expedition to Torres Straits, vol. ii, part 2.

*Carnegie Museum (Pittsburg).—Serial Publications, nos. 13, 16, 18, 19, 22.—Annual Report for 1903.—Annals, vol. ii, no. 1.

Centennial International Exhibition, Melbourne, 1888.—Catalogue of the Economic Plants of Queensland.—Catalogue of the Woods of Queensland.—Catalogue of the Grasses of Queensland.—Catalogue of the Fibres and Carpological specimens grown in the Melbourne Botanical Gardens. Given by W. T. Brigham, Esq.

Cincinnati Museum Association.—Annual Report for 1902.

*Connecticut Academy of Sciences.—Transactions, vol. xi.

Crosby, Mrs. E. Theodore.—The Caroline Islands and Their People.—A day in Kusaie, 1899. Given by the author.

Dixon, Roland B.—Basketry Designs of the Maidu Indians of California, 1900.—Maidu Myths, 1902.

Dixon, Roland B., and Kroeber, Alfred L.—The Native Languages of California, 1903.

Documents, Superintendent of.—Annual Report for year ending June, 1903.—Index of the Subjects of the Documents and Reports, 57th Congress, 2d Session.

Durand, Theophilus, et Jackson, B. D.—Index Kewensis plantarum phanerogamarum, Supplementum primum, fasciculi 2 et 3.

*Field Columbian Museum.—Publications: Botanical, vol. i, no. 7; vol. iii, no. 1.—Geological, vol. ii, no. 1.—Anthropological, vol. iii, no. 3.—Zoological, vol. iii, nos. 7, 9-11.—Reports, vol. ii, no. 2.

Foreign Commerce.—Commercial relations of the United States with foreign countries during 1901, 2 vols. Washington, 1902.

Frazer, J. G.—The Golden Bough, a study in Magic and Religion. 3 vols. London, 1900.

Gardiner, J. Stanley.—The Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. i, no. 4; vol. ii, no. 1.

Geographical Journal, vols. xix, xx.

Guppy, H. B.—Observations of a Naturalist in the Pacific, vol. i. Vanua Levu, Fiji. London, 1903.

*Harvard University Library.—Fifth Annual Report. 1902.

Hawaii.—Map of Oahu. Given by the Government Survey Office. Report of the Governor of the Territory of Hawaii to the Secretary of the Interior. 1903.

Hawaiian Evangelical Association. — Fortieth Annual Report, July, 1903.

Hawaiian Live Stock Breeders' Association—Proceedings of the First Annual Meeting, 1902.

Henshaw, H. W.—On the Habits and Haunts of the Noio or Hawaiian Noddy Tern.—Occurrence of Larus Glaucescens and other American Birds in Hawaii.—Birds of Prey as Ocean Waifs.—Description of a new Shearwater from the Hawaiian Islands.

Ibis.—Eighth Series, vol. ii. London, 1902.

*Indian Museum.—Annual Report, 1901-2.

*Instituto Geologico de Mexico.—Boletin Numero 16.

*Italiana d'Anthropologia, Società.—Archivio per l'antropologia e l'etnologia, vol. xxxiii, fasc. 1 e 2.

Jardin Botanique de Buitenzorg.—Icones Bogorienses, vol. ii, 1ier fascicule.

*Johns Hopkins University.—Memoirs from the Biological Laboratory, vol. v.

Keate, George.—Account of Pelew Islands. London, 1788.

*K. K. Naturhistorischen Hofmuseums, Annalen des. Band xvii; Band xviii, nr. 1.

Kloss, C. Boden.—In the Andamans and Nicobars. London, 1903.

Kongl. Vitterhets Historie och Antiqvitets Akademien.—Månadsblad. 1897.—Antiqvarisk Tidskrift för Sverige, del. xvii, i och ii.

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Law Reports.—Reports of the Decisions rendered by the Supreme Court of the Hawaiian Islands, vols. x-xiv.

*Leland Stanford Jr. University.—Register, 1902-3.—Contributions from the Hopkins Seaside Laboratory. 1903. No. 30.

Liberia. — Bulletin xii of the American Colonization Society. Washington, 1896.

Linnean Society of London.—Proceedings, October, 1902.—Journal, Botany, vol. xxvi.—Transactions, Second Series, vol. vi, part 6.

*Linnean Society of New South Wales.—Proceedings, vol. xxvii, part 3; and supplement, part 4; vol. xxviii, parts 1 and 2.

MacDonald, A. S.—A list of Books Californiana and the Pacific in the Library of A. S. MacDonald. Oakland, 1903.

*Madras Government Museum.—Bulletin, vol. i, no. 1.

*Maryland Geological Survey. — Garret County, 1902; Cecil County, 1902.

Microscopical Science, Quarterly Journal of.—Vol. xlvi, parts 3 and 4; vol. xlvii, parts 1 and 2.

Millican, Albert.—Travels and Adventures of an Orchid Hunter. London, 1891.

Minerva Jahrbuch. 1901-1902. Strassburg, 1902.

Museo Civico di Storia Naturale di Trieste, Atti del, vol. x.

*Museo Nacional de Buenos Aires.—Anales, tomo viii. Anales, tercera serie, tomo i entrega ii.

Museu Nacional de Rio de Janeiro.—Archivos, vols. x and xi.

*Museu Paulista.—Revista, vol. v. Sao Paulo.

*Museum of Comparative Zoology.—Memoirs, vol. xxvi, no. 4; vol. xxviii.—Bulletins, vol. xxxviii, no. 8; vol. xxxix, nos. 4-8; vol. xl, nos. 4-6; vol. xlii, nos. 1-4.

*Museum of Fine Arts.—Bulletin, vol. i, no. 1.

Museum of Zoology.—Annual Report of the Museums and Lecture Rooms Syndicate. 1902.

Nature.—Current numbers.

New Hebrides.—The Original MSS drawn up by the White men of the New Hebrides as a form of the First Legal Government of the Islands. Given by W. Tanner, Acting Secretary.

*New South Wales.—The Geological Survey of.—Records, vols. iii-iv; vol. vii, parts 1-3.—Memoirs: Palaeontólogy, no. 4; no. 5, parts 1 and 2; no. 6; no. 8, parts 1-3; no. 9. Geology, nos. 2 and 5. Ethnology, no. 1.—Mineral Resources, nos. ii, iv-x.—The Mineral Resources of N. S. W., by Edward F. Pittman, Sydney, 1901.

New South Wales, The Wealth and Progress of, by T. A. Coghlan. Sydney, 1887.

*New York Botanical Gardens.—Bulletin, vol. iii, no. 9.

Novitates Zoologicæ.—Vol. ix, nos. 3, 4 and supplement; vol. x, nos. 1 and 2.

Oahu College.—Catalogue, 1902-3 (62d year).

Oberholser, H. C.—A New Cliff Swallow from Texas.—Critical Remarks on Cistothorus Palustris (Wils.) and Its Western Allies.—Description of a New Vireo.—Seven New Birds from Paraguay.—Some New South American Birds.—Some Untenable Names in Ornithology.

*Oberlin College.—The Wilson Bulletin, vol. x, nos. 1-4.

Ohio Agricultural Experiment Station.—Bulletin, Technical Series, vol. i, no. 4.—A Preliminary List of the Birds of Wayne County.

Ornithologie.—Journal für Ornithologie: li Jahrgang Heft i-iv.

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*Peabody Museum of American Archæology and Ethnology.—Memoirs, vol. ii, no. 2.

Pepper, George H.—Native Navajo Dyes. 1903.

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*Philadelphia Commercial Museum.—The Commerce of Latin America. 1903.

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*Polynesian Society.—Journal, vol. xii, nos. 1-3.

Popular Science Monthly.—Current numbers.

Religious Systems of the World. A Collection of Addresses delivered at South Place Institute. London, 1901.

*Rijks Ethnographisch Museum te Leiden.—Verslag van den Directeur, 1901-1902.

*Royal Society of New South Wales.—Journal and Proceedings, vol. xxxvi.

*Royal Society of Queensland.—Proceedings, vol. xvii, part 2.

*Royal Society of South Australia,—Transactions, vol. xxvi, parts 1 and 2; vol. xxvii, part 1.—Memoirs, vol. ii, part 1.

*Royal Society of Victoria.—Proceedings, vol. xv, part 2; vol. xvi, part 1.

*Royale. Société Royale des Antiquaries du Nord.—Memoirs, nouvelle serie, 1902.

*Royale. Société Royale Malacologique de Belgique.—Annales, tome xxxvi.

Sherborn, C. D.—Index Animalium. 1758-1800. Cambridge, 1902.

Skeat, W. W.—Malay Magic. London, 1900.

*Smithsonian Institution.—Annual Report to June, 1901.—Annual Report to June, 1902.

*South African Museum.—Annals, vol. ii, parts 10 and 11; vol. iii, part 1.—Report for the Year 1901.

Squier, E. G.—Tropical Fibres. London, 1863.

Starr, Frederick.—Indians of Southern Mexico. Chicago, 1899.

Stejneger, Leonhard.—The Russian Fur-Seal Islands. Washington, 1896.

Tryon and Pilsbury.—Manual of Conchology. Current numbers.

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U. S. Geological Survey.—Mineral Resources of the United States for the years 1900 and 1901.—Bulletins, 191, 195, 204.—Water Supply and Irrigation papers, nos. 65-79. Given by the Department.

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*Universiteit van Amsterdam.—Catalogus der Handschriften ii, 1902, and iii, 1903.—Feiten en Cijfers door den Bibliothecaris. 1902.

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*University of Kansas.—Bulletin, vol. i, nos. 10, 11, 12.

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Valentine Museum.—Report of the Exploration of the Hayes' Creek Mound. Richmond, 1901.

*Wagner Free Institute of Science.—Transactions, vols. i-vi.

Westermarck, Edward.—The History of Human Marriage. London, 1901.

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Zoological Society of London.—Proceedings, 1901, vol. ii; 1902, vol. i.—Index, 1891-1900.

LIST OF EXCHANGES.

Academy of Natural Sciences of Philadelphia.
American Museum of Natural History. New York.
American Philosophical Society. Philadelphia.
Amherst College Library. Amherst, Mass.
Anthropological Institute of Great Britain and Ireland. London.
Anthropologische - Ethnographische Sammlung. Berne.
Anthropologischer Gesellschaft. Berlin.
Anthropologischer Gesellschaft in Wien.
Asiatic Society of Bengal. Calcutta, India.
Auckland Institute. Auckland, N. Z.

Australian Museum. Sydney.
Boston Public Library.
Boston Society of Natural History.
Brooklyn Institute of Fine Arts and Sciences.
California Academy of Sciences. San Francisco.
Cambridge Philosophical Society. England.
Canterbury Museum. Christchurch, N. Z.
Carnegie Museum. Pittsburg, Penn.
Colonial Museum. Wellington, N. Z.
Columbia University Library. New York.
Connecticut Academy of Arts and Sciences. New Haven.
École d'Anthropologie de Paris.
Field Columbian Museum. Chicago.
Free Museum of Science and Art. Philadelphia.
Geological Survey of New South Wales. Sydney.
Gordon Technical College. Geelong, Australia.
Harvard University Library. Cambridge, Mass.
Hawaiian Evangelical Association. Honolulu.
Hawaiian Historical Society. Honolulu.
Hilo Public Library. Hilo, Hawaii.
Honolulu Library Association. Honolulu.
Indian Museum. Calcutta, India.
Jardin Botanique de Buitenzorg. Buitenzorg, Java.
Johns Hopkins University. Baltimore.
K. K. Naturhistorische Hofmuseum. Wien.
Kgl. National Museet. Copenhagen.
Kongl. Vitterhets Historie och Antiqvitets Akademien. Stockholm.
Königliche Ethnographische Museum. München.
Königliche Museum für Völkerkunde. Berlin.
Königliche Zoologische und Anthropologisch - Ethnographische Museum. Dresden.
Leland Stanford Jr. University. California.
Library of Congress. Washington.
Linnean Society of London.
Linnean Society of New South Wales. Sydney.
Madras Government Museum. Madras, India.
Marine Biological Association of the United Kingdom. Plymouth.
Maryland Geological Survey. Baltimore.
Mexico Instituto Geologico. Mexico.
Museo Civico di Storia Naturale di Genoa.
Museo Nacional de Buenos Aires.
Museu Goeldi. Para, Brazil.
Museu Paulista. Sâo Paulo, Brazil.
Museum of Comparative Zoology. Cambridge, Mass.
Museum of Fine Arts. Boston.
Museum für Natur-, Völker- und Handelskunde. Bremen.

Museum für Völkerkunde. Leipzig.
New Zealand Institute. Wellington.
Oahu College. Honolulu.
Oberhessische Gesselschaft für Natur- und Heilkunde. Giessen.
Peabody Academy of Science. Salem, Mass.
Peabody Museum. Cambridge, Mass.
Philadelphia Commercial Museums.
Polynesian Society. Wellington, N. Z.
Public Museum. Wanganui, N. Z.
Real Academia de Ciencias y Artes de Barcelona.
Red Meteorologica y Revista cientifica del Estado de Mexico.
Rijks Ethnographisch Museum. Leiden.
's Rijks Museum van Naturvlijke Historie. Leiden.
Royal Geographical Society. London.
Royal Society of Edinburgh.
Royal Society of New South Wales. Sydney.
Royal Society of Queensland. Brisbane.
Royal Society of South Australia. Adelaide.
Royal Society of Tasmania. Hobart.
Royal Society of Victoria. Melbourne.
Smithsonian Institution. Washington.
" " Bureau of American Ethnology. Washington.
" " U. S. National Museum. Washington.
Società Italiana di Antropologia e Etnologia. Firenze.
Société de Anthropologie. Paris.
Société Royale des Antiquaires du Nord. Copenhague.
Société Royale Malacologique de Belgique. Bruxelles.
South African Museum. Capetown.
South Australian Museum. Adelaide.
U. S. Experiment Station. Honolulu.
Universiteit van Amsterdam.
University of California. Berkeley, Cal.
University of Kansas. Lawrence, Kansas.
University of Montana Biological Station.
University of Pennsylvania. Philadelphia.
Wagner Free Institute of Science. Philadelphia.
Wytsman, P. Bruxelles.
Yale University Library. New Haven.

Remarks on Phallic Stones from Rapanui.

MR. J. L. YOUNG, whose knowledge of the southeastern Pacific is very extensive, loaned the Director of this Museum the stone which he has described as follows:

These objects are generally of a more or less disc-like shape, weighing four or five pounds each; are composed of hard close-grained stone, and are covered on both sides with rudely carved conventionalized representations of the female vulva. They are called by the natives of Rapanui "Maea momoa" (maea = stone; momoa = descendants, family); also called "Maea hika" (hika = clitoris). (cf. Maori—momoa = offspring; and hika to rub: to make fire by rubbing.) One of these stones is shown in Fig. 4, Plate LI, between pp. 534 and 535 of Smithsonian Report, U. S. National Museum, 1889; and on page 537, *Ibid*, are some remarks concerning it. But a curious error was made by the officers of the U. S. S. Mohican, for both references on page 537 under the head of "Fish God" (Mea ika) and "Fowl God" (Mea moa) apply to the same stone, the "Maea momoa." The remarks are substantially correct: the stones were more prized than any other object, it being claimed that they had been brought by Hoatumetua, the pioneer chief, from the, as yet, unidentified "Maraetoehau." It is also true that the stones were—but of late years only—placed under domestic fowls with the idea that the fertility of the eggs was thus promoted. It is stated by the few old men who profess to remember the ancient traditions, that since the kidnapping of the learned men by the Peruvian slavers in 1864, the younger generation have lost their respect for the sacred stones, and only in a vague manner felt that they were in some way connected with the reproduction of life: hence their use under the fowls. Doubtless also the influence of the missionaries was against the preservation of the ancient rites.

It is said by some of the old men, who until lately resided in Tahiti, that these stones were used in the ceremony of "Hakatoro repe" Hakatoro = to cause to stretch, to elongate: Repe = clitoris); also called by one old man "Hakatoro matakaho" (matakaho = clitoris). This rite was practiced on girls shortly before they arrived at puberty. A similar rite was in use at the Marquesas

Islands in former years. It is worthy of remark that at Ponape (Carolines) the *labia minora* were stretched until they were more projecting than the *labia majora*. No detailed account of the ceremony could be obtained, except that the operator, who was always an old man or "tuhunga" (lit., priest or wise man) pinched the clitoris with finger and thumb, or between pieces of reed or bamboo, so as to make the end swell. Having thus enlarged the end of the organ so that a string could be fastened to it, he proceeded to put a noose of fine twine over the swelled end with a slip-knot, and fastened a small stone as a weight to the twine, which gradually elongated the clitoris until it was, in course of time, two to three inches long. Care had to be taken, said the narrators, to relax the noose occasionally, lest the end of the organ should drop off; in which case no one would take the girl to wife, as she would be "kopiri" (lit., adhering together), also conveying the idea of deformity or being misshapen.

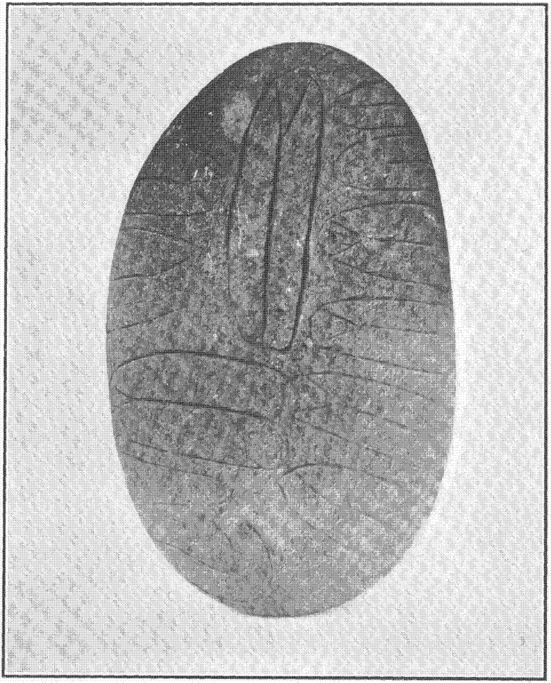
The part played by the "Maea momoa" in the ceremony is obscure: the narrators declared, however, that it was a necessary adjunct to the function, and that without its presence the rite could not be performed. It was "taonga tuhunga"=the valued implement or amulet of the priest. It was also stated that each clan or "manga"=division or family, of a tribe had a separate stone, called by the name of the ancestress, as the carved staves were, but identification of the stones as belonging to any one clan could not be obtained. Very few of the old men are left, and most are quite unreliable.

It may be remarked that the writer knows of only five original "Maea momoa" (there are imitations, made some years ago): of these, one is in the U. S. National Museum, one in Santiago de Chile, and three in the possession of the writer—one of which is at present in the Bishop Museum. Of the two others, now in Auckland, one is somewhat similar in shape to that in the Bishop Museum; the other is a rectangular bar of hard stone, 20 in. in length by 4 in. square, all of one side being covered with the figure of the pudendum.

It is said that the rite described was ordained by Tane Harai, the father of Hoatumetua, who, before his son left the land of Maraetoehau, said, "Forget not the practice of Hakatoro, for by that shall it be known whose sons ye are."

All foregoing has been obtained from time to time during past eighteen years from natives of Rapanui. The writer obtained the first stone in 1885, and the two others in 1887.

 J. L. YOUNG.



MAEA MOMOA FROM RAPANUI.

Aboriginal Wooden Weapons of Australia: Illustrative of the Collection in the B. P. B. Museum.

By Leopold G. Blackman: With Drawings by the Author.

The collection of Australian implements in this Museum has lately been augmented by many choice specimens secured by the Director on his recent tour. Although the collection of such articles in the possession of the Bishop Museum is still not extensive, it is well chosen and includes valuable representative specimens of nearly all the best known forms. The object of this paper is to briefly review the wooden weapons of the native Australians, and to give a description of their manufacture and use, chiefly as a guide to the collection in the Museum. An extensive knowledge of the different forms of weapons in use among the many tribes, founded upon all the specimens in public and private collections, is necessary to a satisfactory description of the Australian weapons, but such a work has unfortunately not yet been accomplished. The vast extent of territory to be covered, and the isolation and sometimes the extinction of tribes greatly increases the difficulty of dealing with this interesting subject.

The writings of many authors have accorded the primitive inhabitants of Australia the lowest rung on the ladder of human progress, and proofs are not lacking to show the general low intelligence of this unfortunate race. Yet in warfare and the search for food the degree of skill and resource evidenced by their weapons is remarkable, and proves that however elementary their efforts in other directions, the Australian aboriginals have in these, obtained results possessed by no other people of historic times. Within the limited sphere of these occupations almost the whole of their ingenuity has been confined, and the keen observation which they have here displayed has furnished them with weapons of peculiar construction which they use with wonderful precision and dexterity. A brief examination of the Australian case in the Museum will reveal at once the unusual design and also the crudity of workmanship employed upon the manufacture of the

specimens, as compared with the achievements of other primitive people. The peculiar bent of the Australian character and also its undeveloped condition are alike illustrated by these two features.

A remarkable similarity of design is found in the weapons of this vast region, due, in great measure, to an extensive system of barter which was established throughout the country in early times. As a rule the manufacture of a specific form of implement was the production of a special tribe or locality, which in some cases was celebrated to great distances for the skill and perfection of its work. Articles displaying the highest finish and best taste in decoration were principally derived from the north and west. No particular class of men was engaged solely in barter, but each man set out as necessity or inclination led, accompanied or alone, and bearing the products of his own industry. Well defined trade routes, upon which the traveller was free from molestation, converged in recognized bartering grounds, where large numbers of natives were often congregated. The usual time for these bartering expeditions was the winter, as dependency on water compelled the journey to be undertaken when this could be obtained. For this reason the routes followed the water holes and river beds, and in some cases they may represent the course of the original distribution of the race, and may have been in use since that early time. The less frequented bartering tracks were often marked by stones or other objects placed at intervals to direct the stranger. A trader would sometimes make his presence known by smoke and fire signals, upon recognizing which others would assemble. One frequent artifice to attract attention was to cover a smoking fire at regular intervals, by means of which an intermittent column of smoke was produced. The hovering of birds over the wayfarer also served as an index to the presence of the trader.

The rare occurrence of the valued quartz quarries, so frequently resorted to by makers of spear heads and cutting instruments, and their jealous possession by local tribes, also tended to confine the production of special articles in individual centres and to stimulate the custom of exchange. The introduction of metal tools and of glass has of recent years depreciated the value of quartz and has also had a detrimental influence on a system once so prevalent. To this must be added the frequent hostility of the white

man which has curtailed and even caused the relinquishment of many old routes.

The articles of most general barter included weapons and tools of all kinds, and the materials for their manufacture and repair. These latter consisted of chips of quartz and other hard rocks, and gum-cement, the best quality of which was obtained from a tree confined to favored districts. Colored pigments for decorating weapons and for mixing with fat to anoint the body at ceremonies, feathers, nets, and occasionally wives were also bartered.

The decoration employed by the Australian upon his implements is elementary in design and often crude, awkward and unfinished in expression. The highest standard of decoration is found in the north and west, where probably Malay and Papuan influence is felt. The ornamentation of the products of these regions is often simple and effective. The general low standard of artistic taste of the whole race is well exemplified by the brutal method of tatuing employed, which consists of ugly parallel cicatrices scored upon the chest and back. The most simple decoration of the weapons consists of a colored design, often not more than parallel bars, painted upon a uniform ground of red or black. Occasionally the ground is omitted, or the ornamentation may merely consist of this alone.

Upon shields, and some boomerangs and clubs, the design is often incised and the interstices filled with ochreous pigments. A common form of such cutting is found chiefly upon certain boomerangs which are completely covered on both sides with roughly parallel grooving, produced by scoring deeply with a bone or quartz chisel. Weapons bearing such decoration are invariably colored entirely red or black, and have a not unpleasing effect. A much narrower instrument is employed to groove the scrolls and other designs upon boomerangs and shields. Another and deeper form of incision, found chiefly upon shields, is produced with a narrow chisel held at right angles to the surface to be cut, and not in the manner as in grooving. By this means an irregular line is produced which gives an effective waving appearance to the design. These three methods of incision will be seen by reference to the shields illustrated in Plate I.

The designs most commonly met with include parallel lines arranged in rectilineals, convergent lines, triangles, squares, the

herring bone and the chevron. Curves and scrolls are more rare, though used with taste on some boomerangs and shields. Crude attempts to represent animals are occasionally suggested, but with little success.

Inter-tribal warfare among the aboriginals was probably always of rare occurrence. Possessing little or no social organization every individual had equal rights, and the carrying of arms was general. When undertaking war the campaign was decided by a council. The plans were deliberated upon with ceremony and secrecy, and on setting out the warriors decorated the head with cockatoo feathers and covered their features with paint. Besides weapons, a wallet was often carried, containing articles for repairs and ochres and tufts of yellow feathers for personal use. Open engagements were rare and attack was delivered if possible from ambush. Early dawn was frequently chosen for assault. As no prisoners were taken the successful party indiscriminately slaughtered all who opposed them. When tracking a single enemy the Australian endeavored to take his man by stealth, and, if opportunity offered, would kill him while he slept.

Single combat, the usual resort in civil quarrel, was frequent. The proceedure at such legal conflicts was regulated by the tribal council. The encounters took place, as a rule, between individuals, though at times tribal disputes were settled by this arbitrament between picked men. The chief causes of dispute were those relating to ownership, more particularly to that of women. A particular time was appointed for the contests, generally in summer, and several days were spent by the participants in preparation for the encounter. This was begun in various ways, sometimes at a distance with boomerang and spear, and sometimes at close quarters. A usual form of duel was with the unwieldy wooden sword, when blows were deliberately given and received in turn. A form of shield, to be described later, was especially made for these occasions. The object was not to kill the opponent, but only to effectually disable him, and the infliction of mortal wounds was forbidden and punished by the tribe. During the contest the women, who were often no uninterested spectators, stood near gesticulating and screaming wildly. Upon their champion being worsted they frequently threw themselves forward with great energy and fiercely endeavored to beat off the attacking foe. The most

popular combatant was more frequently successful than the best fighter, as his friends and relatives stood ready to assist, and at times precipitated a general conflict.

DEFENSIVE WEAPONS.

Of exclusively defensive weapons, the shield alone was used by the Australians. Specimens of irregular and eccentric shape are met with, but these are to be regarded as isolated examples of individual workmanship, and as a rule the shape conforms more or less strictly to an established pattern. These vary materially, not only on account of their source, but also according to whether their use was in single combat or general fight. The following groups are characteristic:

The Mulga Group.—The Mulga shield is made of the hard heavy wood of a species of Eucalyptus and is widely distributed. Its general length is a little less than three feet, and its breadth and depth are each from four to five inches. It was grasped at the middle, where an aperture for the hand was cut. The slender form of the Australian hand is evidenced by the small opening provided for it. As a rule this is little more than three inches broad—a feature which renders the white man unable to hold these weapons properly. The long and tapering form of the mulga was effective for deflecting missiles and for warding the blows of a single adversary. It was used almost exclusively in single encounters, and could afford little protection in the confusion of a general fight. In rare cases a narrow band of opossum or other skin is found wrapped over the face of the weapon and through the handle, to prevent the knuckles from being chafed. A transverse section of the simpler form in which this shield is made shows a trilateral figure contained by one curved and two straight lines, all of approximately equal length. The former being the concave face of the weapon, and the angle of the two straight lines forming the reverse. The aperture for the hand was cut through the angle formed by the latter lines. A better shape of the mulga has the curved face acutely convex and developing into an angle, thus making the section of the shield quadrilateral, and rendering the apical margin better adapted for deflecting missiles. The decoration of the mulga is found only on the obverse surface. It generally consists of incised lines arranged in rectangles and often filled with colored

earths. The specimen seen in the centre of Plate I is representative of the better made mulga shields. It is shaped from the close grained wood of probably a species of acacia, and the incisions were made with a narrow implement held at right angles to the face in the manner already described. The interstices are accentuated with white filling.

The Goolmarry Group.—The shields of this group are elongate-oval in shape and differ in many respects from the mulga form already described. They are constructed of very light wood—*Erythrina vespertilio* the "bastard cork", or *Acacia mollissima* being preferred—and although these weapons are small and well proportioned they have a bulky and unwieldy appearance. The goolmarry is decorated with curved linear designs, often on both sides, though as a rule the obverse is the more elaborately treated. Crude representations of what has been described as a reptile, though bearing more similarity to a clumsily drawn "herring bone," are also sometimes found on the reverse of the goolmarry shield. A section, taken either longitudinally or transversely, is a bilateral figure contained by a straight line and one convex line—the latter to receive the impact of other weapons. The handle is shaped by cutting into the reverse of the shield. Some specimens of the goolmarry exhibit across the curved face irregular charred incisions which have been produced by the friction of another implement in the process of fire making. In rare cases a central longitudinal groove is cut, into which the dust set free by friction accumulates preparatory to combustion. The use of this kind of shield for such a purpose is due to the softness of its wood, and also to the fact that the goolmarry is not so elaborate and consequently of less value than other forms. The ornamentation of the specimen shown in Plate I, No. 8743, is effected by a pattern of interlaced grooved scrolls. The reverse of the shield bears a vague representation of an animal—probably a reptile—and is also charred, particularly at the extremities and hand aperture.

The Western Group.—The manufacture of these shields is confined to the west, though they are extensively bartered. In general form they consist of an extremely thin sheet of wood, elongate-oblong in shape, rounded at the corners, with a projecting handle shaped from the same piece of wood as the body of the

shield. The tree selected for their construction is the bastard cork or Stuart's bean tree, a species of *Erythrina*. The most usual ornamentation takes the form of parallel longitudinal grooves, as a rule showing a pronounced "fault" across the centre. The ground color of the weapon is often dull red. Other patterns of ornamentation are employed, but the one already described is probably the most characteristic. The whole appearance of the western shield is artistic, and much taste is shown in its symmetrical design and simple decoration. The extreme lightness of the weapon, however, renders it liable to split. In such cases, the crack is neatly mended with kangaroo or emu tendon, which is applied wet, in order to bring the edges closely together whilst drying. Such a device is seen in No. 8749, Plate I. The decoration of the obverse is of the kind described, and the scoring on the reverse is similar to that on many boomerangs. Each alternate groove on the front of this specimen is colored dull red.

The Geeam Group.—The Geeam in general contour more nearly recalls the usual pattern of the South African weapons. It is constructed of bark, and in shape is oval, tapering considerably at each extremity of its longest diameter. The manufacture of this shield is somewhat complicated, requiring considerable skill and manipulative dexterity. Its outline is first cut upon the trunk of a living gum tree, and the contained bark is then carefully removed. The best shields are constructed of one piece with the handle, and in this case it is necessary to leave a part of the wood adhering to the centre of the sheet of bark from which to fashion it. Shields of this kind are of ancient work and are difficult to procure. After removing the bark a mound of compressed earth, of the form the weapon is to take, is constructed. This is covered with hot ashes upon which the bark is firmly held until it has taken the permanent shape required. The shield is completed by shaping the handle and decorating. The usual dimensions of the geeam are approximately 40 in. long, 10 in. wide, and somewhat less than ½ in. in thickness.

OFFENSIVE WEAPONS.

The wooden weapons of offense found among the Australians may be broadly divided into two great divisions represented by the spears and clubs. Centring around these are the weapons either associated with their use, or developed from them.

SPEARS.

Australia exhibits a great variety of form in its spears, rendering a simple and satisfactory classification difficult. This is increased by the fact that the same form of weapon may not only, among different tribes, be thrown either with or without the wummera—an instrument to be described later—but also that in various districts it may be used for such distinct purposes as that of warfare or the chase. Before the advent of the white man the Australian possessed no fish hooks, and conducted his fishing operations entirely with the use of the spear. This custom has given many forms of this weapon, some of which are at times used in warfare, but find no place in this paper. Although the method of propulsion of a spear may at first seem unimportant, it necessitates a slight modification in the form of those thrown with the wummera, and in fact constitutes the difference between a true spear and an arrow. A classification of the Australian spears founded upon the different uses, or on the variety of form, is for the above reasons not satisfactory unless confined to the weapons of a particular tribe. Speaking generally, these weapons fall into two well marked divisions, the hand spears and those propelled by the aid of the wummera. A spear intended for one or other of these two uses is readily distinguished; but the division, though true of individual specimens, is often arbitrary when applied to the various forms.

HAND SPEARS, TAPERING BUTT.

The hand spears are charactered by their tapering butt, which renders them unsuited for use with the wummera. They are also generally made of only one piece of wood.

Unbarbed Hand Spears.—In its simplest form the hand spear consists of a long cylindrical shaft of a single piece of wood, from 8 ft. to 10 ft. in length, and sharpened to a point at the distal extremity. Occasionally a ring of gum-cement is placed towards the point in which to imbed jagged flakes of quartz or similar cutting material. A close inspection of a specimen may reveal where such a ring has once been. In order to throw the hand spear it is held over the shoulder resting upon the palm of the hand and the thumb, which latter is extended below the shaft of

the weapon pointing towards the butt. A common variety of the unbarbed hand spear exhibits a broadened spatulate-shaped point.

Barbed Hand Spears.—Another well distributed form of the hand spear possesses barbs. The "Nandum," from 8 to 11 ft. long, is the simplest variety. It is shaped from a single piece of hard wood, into which the barbs are cut. These consist of a single row of deep serrations, situated on one side of the weapon, and requiring both skill and patience in cutting. A variety of the barbed hand spears has a double row of serrations arranged oppositely. Several short specimens of the barbed hand spear are in this Museum. They were probably not intended for throwing, but were gripped in the hand for thrusting at close quarters.

WUMMERA SPEARS, CONCAVE BUTT.

The distinguishing feature of these spears lies in the small concave depression found at the proximal end of the weapon into which the peg of the wummera is inserted. These weapons may be constructed of one, two, or three pieces of wood.

Spears Constructed of One Piece.—Quartz-tipped spears are made of a single slender shaft, bearing the characteristic hollow at the butt end, and grooved at the other extremity for the insertion of a row of flakes of quartz, or black or white basalt. The chips and gum into which the former are imbedded are frequent objects of barter. The quartz spear is capable of inflicting terrible lacerated wounds. Two opposite rows of flakes are probably more frequent than only one.

Spears Constructed of Two Pieces of Wood.—The Tirrer or reed spear generally consists of two pieces. The shaft is made of a slender reed, *Typha augustifolia*, into which is fitted a tip of poisonous mulga wood. Towards the point, bound with kangaroo or other tendon, is placed a barb of wood or bone. The extreme length of the tirrer, which may be as much as 12 ft., requires the use of both hands in trajecting it, one being employed with the wummera, and the other stretched forward to direct the spear.

Spears Constructed of Three Pieces of Wood.—The "Koanie" form of spear is formed of three separate pieces representing respectively the butt, shaft and tip. Of these, the shaft is firmly fixed to the butt, but more loosely to the tip which is spatu-

late in shape, broader at the free end, and often provided with a barb of wood, bone, glass or wire bound firmly to its face. The object of the loose tip is to allow the shaft to break away from the head when the enemy is transfixed, thus rendering the weapon more difficult to extract. The shaft of the koanie is often well ornamented with grooving, and proved weapons are elaborately finished, highly valued, and difficult to obtain.

Many other forms of spear are found, but are not so well known and general as the ones already described. Stone-headed spears, the product of the north, are much prized. The trigonal flaked head is fastened with resin covered with kaolin and the haft is generally freely ornamented. Fishing spears, bident or trident in form, are sometimes carried for use in war and the chase, but should not be classified among the weapons of this paper. Various specimens of the above forms of spears will be found in or near cases 16 and 17.

WUMMERAS.

Closely associated with the use of the concave-butted spears is the Wummera, a device for increasing the velocity and range of the latter weapons by lengthening the arm leverage, on the same principle as that employed with the better known sling. The wummera consists in general of a wooden haft of varying length, upon which the spear lies before trajection. At the distal end of the weapon a small projecting peg is situated to engage the hollow depression at the extremity of the missile. To throw the spear, the native stands sideways, holding the handle of the wummera firmly with the three smallest fingers of the right hand—the arm being directed backwards over the shoulder. Upon this support the spear rests, adjusted to the peg, and retained in position with the finger and thumb of the same hand. One hand only is employed with most spears, but the length of the tirrer or reed spear renders the use of the left hand also necessary to support this form of weapon. Great dexterity is shown in fitting the spear to the wummera, a feat which the native readily accomplishes without removing his gaze from the object of attack. The velocity imparted to the missile by the wummera is great, and an effective range of 100 yds. is obtained.

The possession of this weapon by the Australians is sometimes regarded as rendering the use of any other device of trajection

unnecessary, and thus sufficiently accounting for the ignorance of this people of the bow and arrow. The occurrence of implements similar to the wummera in other regions, particularly among some American tribes at the time of the discovery, and also among European palæolithic remains, is well supported. In these instances the wummera antedated the bow and was supplemented by it. Modern investigation points to the antiquity of the Australian race and its isolation from the Asiatic continent in remote ages. The use of the wummera in this case may therefore be regarded as the survival of a primitive weapon among a race which has progressed little or not at all since its separation from the rest of mankind, rather than affording evidence of high intelligence. The boomerang and wummera were unknown to the Tasmanian aboriginals, which suggests their emigration from the primitive stock before the discovery of these weapons.

Many forms of the wummera are in use throughout the country, the shape varying greatly according to the district of manufacture. The origin of each individual specimen is of great interest and importance, and a systematic description of all the weapons of this region arranged with reference to their source would be of great value. The earliest form of the weapon under consideration consisted of an ordinary straight branch, with a projecting twig at one end shaped to furnish the necessary peg. The breaking of the latter would render the primitive form of weapon useless, and an advance would be made by the substitution of a separate peg of wood or bone attached with tendon and gum. Roughly fashioned implements of this description are common. A new feature in the wummera is seen in No. 1913, Plate II, consisting of a well defined broadening of the middle part of the haft. This was of use for carrying the colored pigments used at initiation and other rites. The peg of this weapon is a piece of shell, part of which has been broken away. The wummera, No. 1910, Plate II, is an extremely light and well made specimen in which the entire haft is adapted for carrying. It is constructed of hard red wood, and the peg is neatly shaped from a piece of light yellow wood. Weapons possessing the broadened haft are known by the name "Amera." They are made in the west and are ornamented on neither side. The handle, formed by a knob of gum, appears to be characteristic of these

weapons. The resistance of the wide surface of the amera to the air must impair the efficacy of these weapons as instruments of propulsion. In some cases the haft is even further developed by hollowing a somewhat thicker piece of wood to the shape of a shallow trough in order to contain blood and other fluids at the ceremonies alluded to. In fastening the peg to the amera holes were pierced at the distal end through which to pass the binding tendon. Instances of boring among the Australians, who possessed no pierced stone weapons, are rare. The edge of the amera is sometimes used in the process of fire-making by drawing it across the anterior face of the goolmarry shield in the manner already described.

The wummera seen in Plate II, No. 1911, has the tray development entirely eliminated. This well balanced weapon is constructed of light wood, and its great leverage should render it very effective. The wooden peg is held in place by the usual gum-cement. The handle is shaped from and forms one piece with the haft. By referring to the specimens in Plate II, three stages in the development of the handle are noticeable. Wummeras constructed of only one piece of wood and elaborately ornamented are also found, but this Museum is as yet unfortunately without a specimen. Other weapons have the peg fitted to the edge of a lathe-shaped haft instead of to the face as in the weapons considered. A not unusual feature of some wummeras is a piece of shell fastened to the proximal end of the haft for use as a scraper or chisel. Besides the materials already mentioned as furnishing the peg, the tooth of a kangaroo or slain enemy was sometimes used. The tendon employed for binding the peg was furnished either by kangaroo or emu leg, or by the neck of a snake.

The natives of New Caledonia possess a device for throwing spears consisting of a cord and loop. It is identical in principle with the ancient *amentum*. The kotaha, or sling-stick of the Maoris, formed of a wooden handle and a knotted dogskin thong, is also worthy of attention here. The arrow to be propelled with this implement was first loosely stuck in the ground, point upwards behind the thrower, towards whom it inclined at an angle of 30 or 40 degrees, and to this the thong was then looped in a manner to disengage readily directly the impetus of flight was imparted.

CLUBS AND THEIR DEVELOPMENTS.

The order of arrangement of the following weapons shows the line of development by which the more advanced may have been produced from those of primitive form.

Straight Hand Clubs.—The simplest form of these weapons is the straight, heavy pole of hard wood, uniform in girth through most of its length, but tapering abruptly at each end, and often grooved at one extremity to allow a good purchase to the hands. This somewhat cumbersome weapon could only be used at close quarters and was never thrown. A good specimen is shown in Plate III, No. 7443. These weapons are more or less cylindrical in form, and their weight and size rendered the use of two hands necessary to wield them. To deliver a blow the club was grasped by both hands at one end, and swung forward from over the head. In guarding, the adversary grasped his weapon with a hand at each end, holding it either horizontally above the head, or vertically to left or right to protect the part attacked. The two-handed club was also used by the "gins" who stood ready to assist or rescue in the civil combats already described.

The Waddy is a common form of hand club for use with one hand only. It is much shorter than the above form and possesses a well developed head, more or less diamond-shaped, which is generally decorated with the usual incisions. The waddy was frequently chosen together with the mulga shield in the single encounters, when the head was the only permissible object of attack. Although this club was often thrown, its true place was among the hand clubs. An endless variety of form is found among these weapons, often due to the natural shape of the wood from which they are made. Some of the lighter are pointed at the end in order to turn over in flight and pierce the body of the enemy when thrown at close range. Specimens in this collection can be seen in cases 16 and 17.

A tendency to lighten the two-handed club by flattening it—a device which gave a more wieldy and at the same time a more effective weapon, is seen in No. 8761, Plate III. This formidable paddle-shaped weapon is a splendid example of Australian workmanship. It is fashioned from dark close-grained wood, probably *Erythrophleum laboucheria*, and bears a pattern in white painted

at the distal end which has become indistinct through use. The thickening of the handle to prevent slipping is noteworthy, as is also the depression at the end. A cross section of this fine club reveals one face more convex than the other—a characteristic feature, not only of all boomerangs but of many other Australian weapons. A splendid example of the so-called native sword is also shown in Plate III, No. 8745, which exhibits a full development to the spatulate form from the early cylindrical type. Specimens of such weapons are rare and generally of ancient workmanship. The handle of the specimen considered is covered with gum-cement, and the remains of a few irregular red bars are seen at the distal end. A more modern form of sword, which is said to owe its shape to white influence, though unconscious imitation of the boomerang may also have assisted, is shown in Plate III, No. 7444. The unusual size of this weapon must have greatly lessened its value. Ornate sword-shaped clubs are also found, the use of which was probably ceremonial or executional.

Bent Hand Clubs.—The earliest form of this weapon was the simple crook afforded by the natural bend of the branch from which it was shaped. Its use at first was probably little more than for reaching a body which had fallen in battle, in order to drag it from the fight. Such a primitive implement is seen on the ceiling of the Australian alcove, No. 8751. Soon, however, the efficacy of this weapon as a means of attack was appreciated, and the invention of the "Leonile"—the most dangerous of Australian close combat weapons—resulted. The deadly quality of this club is due to its shape, which allows the attacker to reach over the guard of the enemy with a blow almost impossible to parry. Another feature, and one which probably greatly enhanced its value to the native, was that the kidneys of the enemy, the seat of life, were exposed to the attack of the leonile. The weapon is similar to the simple hook club in general shape, but it is flattened and the distal end is acutely pointed. To construct this weapon advantage is taken of a suitable growth in the branches or roots of a hard wood tree such as the *Eucalyptus exurata*. A far more formidable weapon of the same kind and of enormous reach is seen on the ceiling among the Solomon Island weapons in the alcove devoted to that region. Of such weapons the Museum possesses several specimens

of excellent finish, contrasting strongly with the crude execution of the Australian implements. Similar weapons may also be seen in case 9 among the Niuë specimens.

Throwing Clubs.—These weapons differ from those already considered in the fact that they are generally lighter in weight and are essentially missiles. At first little more than a sapling, with the adhering wood shaped to form a head, the Nulla-nulla in time assumed a more definite and well recognized pattern. In general shape it consists of a cylindrical piece of wood some 2 ft. long, sharply pointed at each extremity. Its diameter is little more than an inch, which gradually increases a few inches from the distal end to form a head and to weight the weapon. Specimens of the nulla-nulla are seen on the wall of case P. 16. These weapons were commonly in use throughout the country.

A well marked step in the development of the boomerang, or at least a witness to the fact that the curiosity of the Australian was directed to investigating the possibility of extending the range of missiles beyond that imparted by the impetus of the unaided human arm is seen in the Weet-weet. This primitive device, although used as a toy, was capable of inflicting severe wounds. Its form closely resembled an attenuated nulla-nulla, and its similarity in flight to the rat-kangaroo has sometimes given it the name of that animal. The weet-weet consists of a small cylinder of wood, two or three inches long, pointed at the ends, and bearing at one extremity a tail of flexible wood some 20 in. long. It was thrown closely parallel to the earth, upon which it continually ricochetted in its flight. Its range has been measured at 220 yds. Although no specimen of this curious device has been examined by the writer it appears to owe its great flight to acceleration imparted by the vibrations of the flexible tail, set up by its frequent impact with the ground.

BOOMERANGS.

The boomerang is undoubtedly derived from the clubs already described, although to which group, if to any exclusively, its evolution may be ascribed, is difficult to determine. It appears to possess the greatest affinity to the bent hand clubs, which, as has been said, were, on occasion, thrown; and it is certainly credible that the first boomerangs were modifications of the leonile. Inter-

mediate forms of the latter, and also of other weapons and the boomerang, have been met with. In this reference it is interesting to note the frequent occurrence among the Australian weapons of specimens whose section shows one surface distinctly more convex than the other—an invariable attribute of all boomerangs. It must be remembered that the war boomerang did not return to the point of trajection, and the development of this weapon to the conventional pattern was more probably due to a slow process of experiment and improvement than to accidental discovery, to which the returning boomerang probably owes its origin.

The occurrence of the boomerang among the ancient Assyrians and the Egyptians, whose sculpture occasionally represents weapons of apparently similar construction, is often advanced, as is also reference to such a weapon in ancient literature. Whatever former people were familiar with its properties, it appears conclusive that all authentic record of such knowledge has been lost.

One of the most characteristic impulses of the Australian was to throw at his quarry or adversary, and every weapon was, on occasion, used in this manner. Following the same line of improvement as had already produced the spatulate sword from the primitive cylindrical club, the Australian was not long in learning that a flat missile cleaves the air more easily and has a greater effective range than a round one. At the same time he unconsciously took advantage of the fact that the suspension of a thin plane moving horizontally with the earth is assisted by atmospheric resistance. The gradual evolution of the boomerang was the result.

The war form of this weapon differs from the returning variety chiefly in its angle of curvature, which is more obtuse, and in the fact that it lies in one plane and is not twisted, to which latter device the return boomerang owes its elliptical trajectory. All boomerangs, however, have the surface, which in flight lies upper, more convex than the lower, and the convex or outer margin sharply edged. The war boomerang is an effective and dangerous weapon, having a range of 150 yds., and having been known to pass completely through an adversary when the body was first struck by the point of the weapon. Boomerangs were often manufactured and bartered in pairs, being cut together from one piece of suitably shaped wood. The possessor of a good pair would not readily dispose of them separately.

The chief differences exhibited in the various forms of war boomerang are those of ornamentation, size and angle measurement. These characteristics are chiefly of local significance. As a rule the north and west produce the most interesting specimens, those of the best decoration being made by the former; and the Kylie, a keen, effective little weapon weighing often only a few ounces, and possessing two angles, coming from the latter. The manufacture of boomerangs is, however, general and their barter extensive. The wood most generally used is a species of acacia. The following forms of war boomerangs, based upon their ornamentation, are noteworthy:

Fluted.—Boomerangs of this kind were invariably ornamented on both sides and uniformly colored red or black. The weapon shown in Plate IV, No. 8737, is representative, except in its extreme size, which reaches 49 in. It was used by the extinct Dieyeri tribe of Central Australia, and was obtained at Coolya water-hole. The color of this weapon is a dull red, and the irregularly parallel flutings have been scored with a flint chisel.

Colored.—Boomerangs of this class are either colored red throughout or are marked with broad transverse red bands. The specimen No. 1369, Plate IV, is from the Albany tribe of West Australia. It is chiefly remarkable for its lightness and for its peculiar shape, which approximates to that of the sickle and furnishes the weapon with two distinct angles.

Carved.—These weapons are characteristic of the northeast. They are incised with neatly made curved lines upon their upper surface only. Two specimens are illustrated in Plate IV. Of these No. 7030 bears representations of what may be reptiles. No. 1367, from Queensland, is somewhat similar to the last specimen in design; the compound line running throughout its whole length is effective.

Plain.—Weapons bearing no ornamentation, either of incision or coloring, are common. Specimens of these will be seen in the Australian cases.

The feat of throwing the boomerang is difficult to any but a native. The peculiarities of each weapon have to be considered

and the owner of a good boomerang, by frequent practice, can use it much more efficiently than a stranger. Before throwing his weapon the native carefully observes the condition of the atmosphere, and holding the boomerang much as a sickle is grasped essays two or three preliminary passes in the air and then discharges it in a position nearly vertical with the ground. The bias imparted to the weapon by the arm movement at the moment of release causes it to quickly assume a horizontal position which is retained during flight.

The final step in the development of the war boomerang is reached in the specimen shown in Plate IV, No. 8748. The "swan-necked" or "hooked" boomerang resembles an ordinary one with a well developed horn borne upon the convex margin of the distal end. This remarkable form of weapon is rare. In some weapons the horn is itself curved, its concave edge lying nearest to the convex margin of the main shaft. The object of the horn is to swing the weapon round upon the guarding club of an enemy, the horn engaging with the latter and revolving upon impact. Some ordinary boomerangs have a hook of this kind attached to them, and occasionally a weapon of ordinary form shows a mark where such a hook has been broken off. The hooked boomerang could also be used effectively in close combat in the same way as the leonile. The specimen figured is from North Australia. It is entirely covered with the fluting ornamentation, and is colored red throughout.

A description of the returning boomerang, called by the natives "Come back", is not within the scope of this paper. The implement was not of use in war and is merely referred to here as marking the culminating point of Australian invention. The discovery of this weapon was undoubtedly accidental, and the flight of the first returning boomerang most probably resulted from the peculiar twist of a specimen of the ordinary form. That such an accident should have been inquired into, and the cause of its return not only appreciated but applied to similar weapons is significant of the acute observation of the people. The occurrence of the returning boomerang is confined to Australia, and evidences of its use elsewhere are unreliable. In the first weapons of this kind the return

motion was probably not much more than a distinct curve from the line of original impetus. A good thrower is said not only to be able to make a come-back complete three gyrations, but also to be able to throw any ordinary boomerang in such a way as to make it return to his vicinity. It is needless to say that the aim of a weapon thrown in order to return is erratic, and its range is far more limited than when propelled in a direct course.

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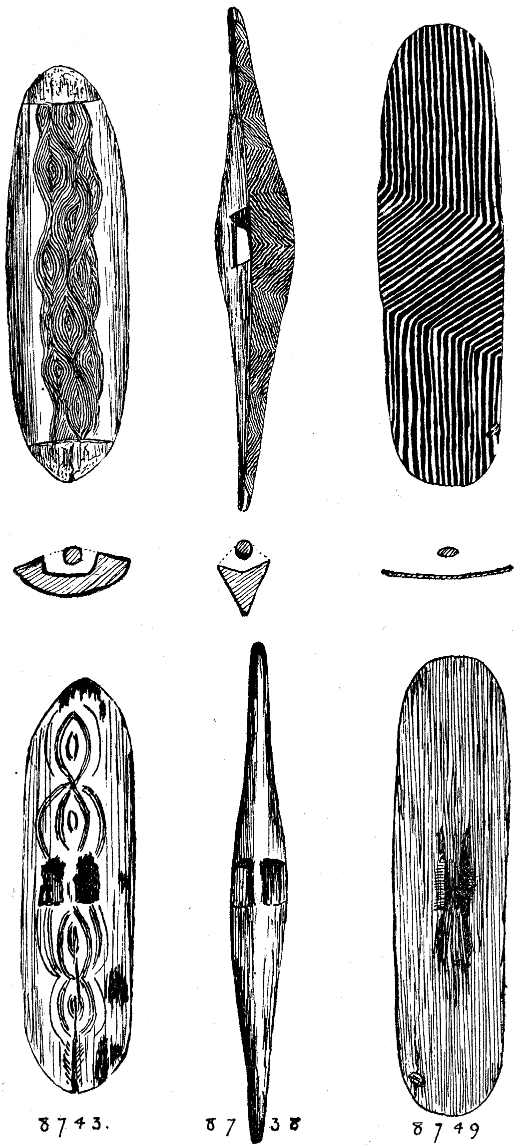
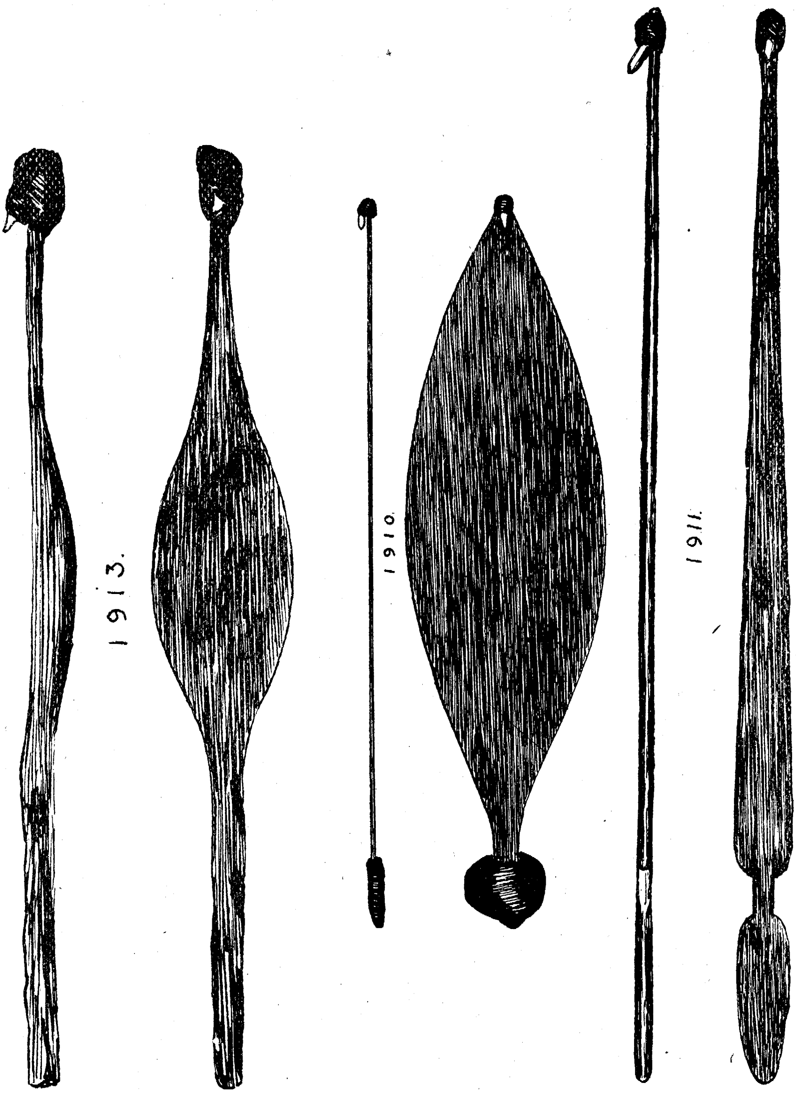


8743. Goolmarry Shield. Length, 24.75 in.; width, 7 in.; thickness, 2.75 in.; weight, 4.25 lbs. Eucalyptus wood(?).

8738. Mulga Shield from Victoria. Length, 31 in.; width, 3 in.; thickness, 4 in.; weight, 1.25 lbs. Acacia wood(?).

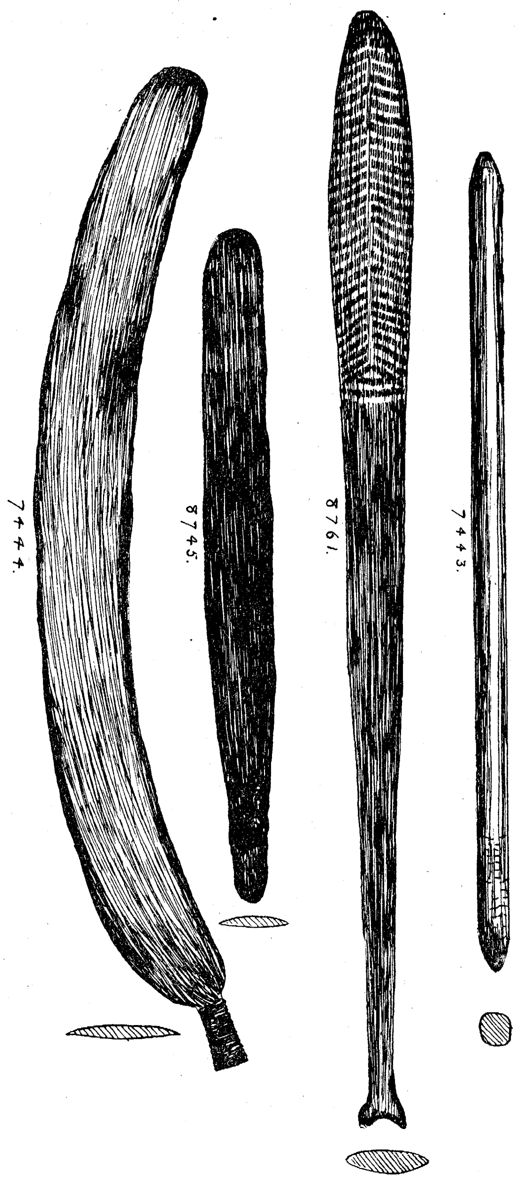
8749. West Australian Shield from Kimberly. Length, 28 in.; width, 7.25 in.; thickness, 0.25 in.; weight, 1.5 lbs. Erythrina wood(?).



1913. Wummera from South Australia. Length, 21.75 in.; width of tray, 2.5 in. Peg of shell imbedded in gum.

1910. Wummera from West Australia. Length, 23 in.; breadth, 6.25 in.; thickness, 0.2 in. Wooden peg, gum handle.

1911. Wummera from North Queensland. Length, 38 in.; greatest width, 1.75 in.; thickness, 0.5 in. Wooden peg.

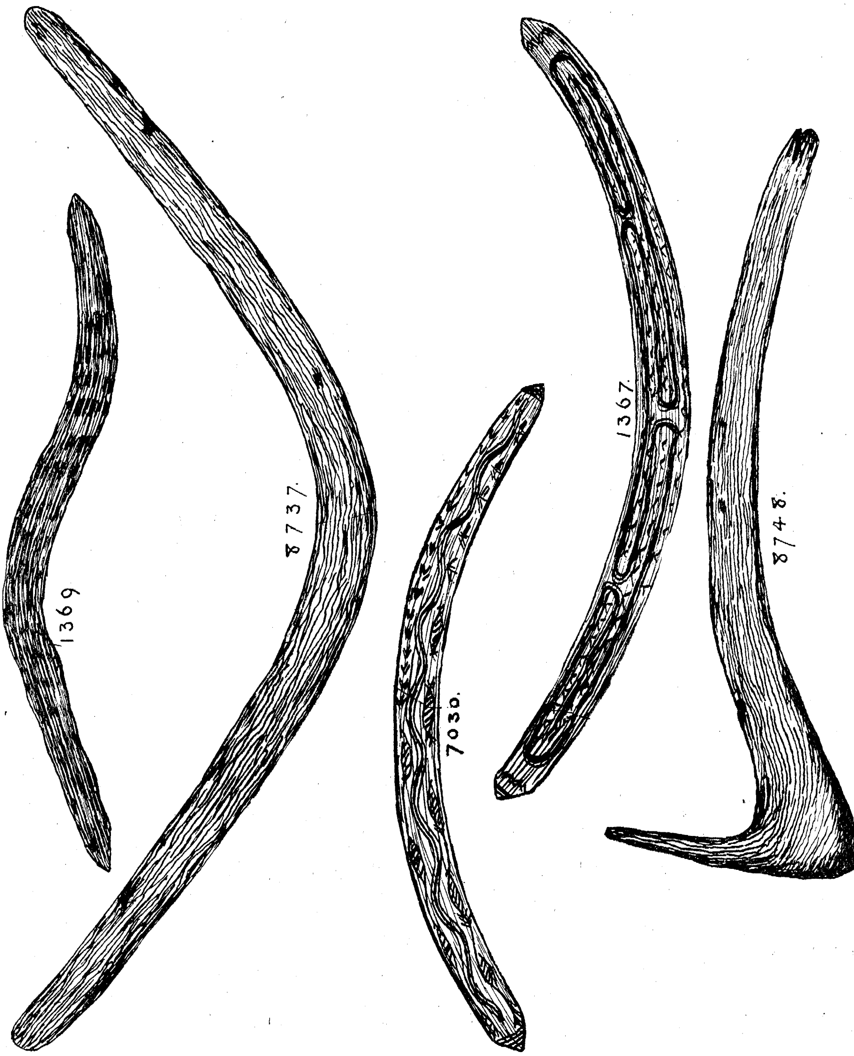


7443. Two-handed Club. Length, 42 in.; diameter, 1.75 in.; weight, 3.6 lbs. North Australia (probably Queensland).

8761. Paddle-shaped Club, or "Meyarroll," with fishtail handle. Length, 52 in.; width, 3.75 in.; thickness, 1.25 in.; weight, 4.2 lbs. Port Essington, North Australia.

8745. Ancient Sword Club. Length, 34 in.; width, 3.25 in.; thickness, 0.6 in.; weight, 1.75 lbs.

7444. Curved Sword Club. Length, 49.5 in.; width, 5 in.; thickness, 0.6 in.; weight, 3.6 lbs. Queensland.



1369. Colored Boomerang. Length, 24 in.; width, 1.75 in.; angle, 135°; weight, 4.75 oz. Albany tribe. West Australia.

8737. Fluted Boomerang. Length, 49 in.; width, 2.5 in.; angle, 120°; weight, 23 oz. Dieyeri tribe. Central Australia.

7030. Carved Boomerang. Length, 30 in.; width, 2.125 in.; angle, 145°; weight, 9 oz. Queensland(?).

1367. Carved Boomerang. Length, 33.5 in.; width, 2.125 in.; angle, 150°; weight, 10.5 oz. Queensland.

8748. Horned Boomerang. Length of main arm, 28 in.; width, 2 in.; angle, 150°; angle of horn, 70°; outside length of horn, 9 in.; weight, 15.5 oz. North Australia.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—NO. 3.

Director's Report for 1904.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
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REPORT.

DURING the past year the exhibition capacity of the Bishop Museum has been doubled, and so far as the public exhibition of specimens is concerned it would be best to consider that the utmost extent has been reached; certainly in the Hawaiian department the new Hawaiian Hall furnishes all the room that should be given up to the public. Only in one department there is need perhaps of more exhibition room to facilitate classification. At present both Papuan and Polynesian products are exhibited in Polynesian Hall, which is becoming crowded, although the case room was largely increased in 1903, and as our collections in this line are likely to increase to a considerable extent, it would be well to open another hall in which the Papuan and Melanesian groups could be kept distinct from the Polynesian and then the limit of exhibition space would be reached.

This does not mean that the accumulation of specimens is to cease. The more of these for study the better, but the exhibition of long series of similar objects is unwise, because it tires without instructing the average museum visitor, and all specimens beyond a few typical ones should be kept in the store rooms for preservation and study. The belief is becoming almost universal in all large museums that the exhibition of specimens to the public should be limited, and in some museums only duplicates are exhibited, and this is generally the case on the Natural History side. No Curator would be willing to exhibit type specimens, and with this tropical and very actinic light, choice birds, shells or other colored specimens should be kept in closed cases or lockers if they

are to be preserved and not to be sacrificed to the curiosity of idle spectators who, in this country at least, make use of the Museum simply as a means of passing the time.

At present our bird collection numbers many thousand skins, but only a few hundred will be mounted and exhibited; the bulk of such collection is for study and can be best used in the condition of unmounted skins, and can best be preserved in boxes or trays. An ideal museum should have room for storage largely in excess of exhibition space, and should have ample provision for workrooms. Neither of these requirements do we possess at present.

As a single illustration of this let me refer to the photograph room, which is several hundred feet away from the main building, connected by a coral road whose dazzling whiteness is blinding to the eyes in fair weather. As there is no other suitable room this is used for the storage of book-paper, old furniture, corals, plaster casts and moulds, barrels of fish and many other things. It is used to unpack collections and to make large staff models of volcanoes or groups of birds, and lastly to fumigate or disinfect specimens with carbon disulphide. All of these uses are antagonistic to the photographic work for which it was built. It becomes difficult to use the room for its legitimate purpose, and yet on this use the illustration of our publications largely depends.

Without multiplying illustrations which could be drawn from nearly every department, we come to the greatest need of this Museum,—a wing devoted to the scientific work of the Museum. The Director long since formed plans for such a building, which should accommodate on the ground floor the printing work of the Museum, which is continuous and needs more room than it has at present, the paper stock and illustration blocks; on the first and second floors the various storage and workrooms, and in the attic the photograph gallery with a northern skylight. To such a building the public would have no access, but scientific men could

study and examine specimens undisturbed by the public. When funds are available this should be the first work undertaken.

And now let us see what the exhibition side of this Museum amounts to. For some years careful statistics have been kept of the visitors and they have been classed, not by intelligence, but by nationalities, and these lists, which have been published in the annual reports, show increase in numbers from year to year until the past year, as may be seen by the table given below, the visitors numbered more than 13,000 Whites, Hawaiians, Chinese, Japanese and Negroes. The Museum is at present open free two days in the week, and passengers on the through steamers are admitted on closed days by special permit. It is instructive to compare this attendance, so far as numbers go, with that of some of the larger museums of which we have statistics. The Field Columbian Museum in Chicago is open every day in the week; five of them are pay days (25c) and two are free: on the latter the attendance averages sixteen times that on the pay days. The museum is a large one, covering four acres, and could contain the Bishop Museum in one of its large halls; it includes in its exhibits articles from all over the world and in nearly every department of human knowledge, while the Bishop Museum is limited to the Ethnology and Natural History of the Pacific Ocean, and yet one in three of the population of Honolulu visits the Bishop Museum annually, while only one in six of the population of Chicago visits the Field Museum. The American Museum in New York, probably the best arranged museum of Natural History in the world, is visited by one in eight or nine of the city population. I am aware that we seem to neglect the non-residents, but in New York, where the influx of travelers is greatest the attendance is least in proportion to the population: in Honolulu, where there are comparatively few tourists, the proportional attendance is greatest. It would seem then *that we do more* here for the public than either of these far greater museums, and we make no charge as in the case of the

Chicago museum. Is it, then, likely that if the Bishop Museum was open to the public all the week it would get more visitors?

We must be aware that if the exhibition to the public of specimens, however choice or well arranged, were the sole thing which the Bishop Museum attempts, its reputation might have been established locally; but, except in the tattle of tourists, it would have gone no farther. Its good work, if any, would have been confined to unscientific visitors, the greater part of them uneducated and belonging to what we are accustomed to consider the lower races. In this remote island we might pile up the scientific riches of both the great museums mentioned and science would not have been in any large degree benefitted; few, very few visitors who could truly profit by such treasures could win hither. We must in some way get our wares to a suitable market. Hence I am justified in considering the other side of the museum work far more important than the exhibitionary side. A great part of the visitors for whom the Bishop Museum maintains its exhibition halls at great expense cannot read even the clearly printed labels, and many whose knowledge is greater will not take the trouble to read. Party after party of tourists will sweep through the halls in ten or fifteen minutes, while the patient Chinese will spend hours and even all day here with all his family. Only an observer who is present all the time can form a fair estimate of what intelligence a visitor shows, and it seems to me that two-thirds of the visitors to this Museum have wasted their car fares in coming from town to the Museum. This is especially true of most of the younger school children, who seem to consider a visit to the Museum as only a partial relief from the closer confinement of the schoolroom. Even more so with the Japanese, mostly of the coolie class, who seem to consider it the correct thing to visit the Museum.

So much for the exhibition side of the work, but it should be noted that in these large museums the scientific staff has no duties whatever in this regard after the specimens are in the cases; an-

other set of men take charge of the people visiting the museum, while in this smaller establishment we have but one set of men for all the scientific work and police duty as well, and with the mixed and uneducated population of this town the latter is no sinecure. Every day given to public exhibition then in this Museum means so much less scientific work. Our publications reach a larger audience than could crowd into the exhibition halls.

Let us look for a moment at the scientific work that is possible to this Museum even in the comparatively contracted area that is its chosen field. The problems to be solved are many and curious: in the study of the development and distribution of land shells there are many years of indefatigable work for many enthusiastic naturalists, and this work cannot possibly be done away from these islands where alone the shells are found. The clue to the secrets of variation is perhaps the most promising yet suggested, and it seems our duty to follow it as far as we can. In the study of the life history of our fishes hardly an introduction has been written, and the same is true in all the pathways of our tropical marine life. The field is almost unbounded, the harvest is at hand, and shall the competent and enthusiastic young men who compose the staff of the Bishop Museum be compelled to sit at the border of the field and see others and strangers enter in and reap where they should gather?

If in the judgment of the Trustees this Museum is not sufficiently endowed to attempt these wider problems there are others nearer home that surely should be attempted if this Museum is really what it has been pronounced, the most complete Hawaiian museum in the world. To refer to a definite matter :—the ruins of the ancient *heiau* and *puuhonua* have not been studied, and although two types of heiau have been recognized,—the truncated pyramid and the walled enclosure,—we do not yet know in what proportion these existed, nor whether the difference in structure is due to a differing cult. All these ruins are fast disappearing;

one within the limits of Honolulu has been ground up to make roads, others more distant have been utilized for mill foundations, and the one ruin most intimately connected with the earliest known intercourse of foreigners with natives is in danger of destruction to make way for a railroad. Cook's heiau, if no other, should be preserved. No plans or definite measurements exist. Who knows anything of the heiau so sadly connected with the massacre of Messrs. Gooch and Hergest of Vancouver's expedition? It still exists buried in a dense growth of lantana, and the work of several men for several days would be required to make it accessible for study. This Museum should have plans and photographs of every existing ruined heiau or puuhonua in the group before the Director can complete the account of ancient Hawaiian worship proposed for the Museum publications. Important as this is there are equally pressing matters awaiting our study, matters that cannot well be worked out by private enterprise,—as the ancient system of irrigation by tunnels and canals,—all traces of which are rapidly being obliterated by the more modern, but not more wonderful methods of plantation irrigation.

The picture writing, not uncommon on all these islands, has not yet been critically examined as to date, origin or meaning. Near the heiau of Wahaula, on Hawaii, are the very distinct remains of a considerable village, better preserved than any others that I know, of which we should have careful plans. The few remains of old Hawaiian houses in the remote valleys of Kauai and Molokai should be photographed and their structure noted.

It will be evident to the Trustees that none of these things can be done if the staff is bound to be in the Museum to protect it and the collections it contains from even the unintentional damage of careless or ignorant visitors, and yet it seems undeniably more important that this real work should be done than that a few hundred pleasure seekers should be amused.

Since the last report the Museum staff has been reduced by

GROUP OF BLACK-FOOTED ALBATROSS, DIOMEDEA NIGRIPES AUD.

This albatross, commonly seen sailing about vessels in the North Pacific, forms immense colonies during the breeding season on the low coral islands of the Hawaiian group. The nest may be simply a depression in the sand, or built up of sand, earth and grass, and contains a single egg. Both parents share in incubating the egg and the subsequent rearing of the young. Squid is the chief article of food for old and young, and it is always fed in the manner here shown. The group, consisting of the male, three females, the young and the egg, represents a section taken from a colony of thousands of birds nesting among the bunch grass growing on the sand and fine guano earth about the lagoon on Laysan Island.

the retirement of Messrs Thompson and Seale. This interruption of Mr. Thompson's admirable series of casts of Hawaiian fishes is greatly to be regretted, and it is the hope of all the staff that he may soon be enabled to resume his most valuable work. The other members remain as before and have been doing excellent work, but owing to the lack of funds this work has generally been confined to the preservation of what is already in the Museum rather than to increasing the collections.

Even in the Printing Department we have little to show for a year of hard work; only the Report for 1903 has been published. Owing to unexpected delays, for which the printer was not responsible, the printing of the memoir on Mat and Basket work of the old Hawaiians has not been completed. The compendium of the original descriptions of the species of Achatinella has suffered from the general delay, and it seems doubtful if it can be issued before the end of the year 1905. Several other works are ready for the press, but the time of their publication cannot now be announced.

During the year the large and valuable collection of Hawaiian bird skins made by Professor H. W. Henshaw has been purchased, and thus many rare and exceeding valuable specimens have come to the Museum. Gould's Birds of New Guinea has been added to the Library. The Menage collection of Philippine birds has been deposited in this Museum where it is accessible to students, and Mr. W. A. Bryan has the description well in hand. Mr. Bryan has also prepared two fine groups of albatrosses, *Diomedea nigripes* and *D. immutabilis*. A figure of the latter group is here presented.

The Director, during his vacation in New Zealand and Australia, collected many rare and valuable implements, as will be seen in the list of accessions below. Among these is a bark canoe from northern Australia, which seems to differ from others figured and described, and seems worthy of illustration.

The collection of corals from Oahu and Molokai made by Messrs. Stokes and Cooke is a notable one, containing new species

which will be described by Dr. T. Wayland Vaughan of the United States Geological Survey, and will serve as a basis for a popular handbook of Hawaiian corals which Dr. J. E. Duerden has promised to prepare.

TABLE OF ATTENDANCE.

1904.	Whites.	Hawaiians.	Portuguese.	Chinese.	Japanese.	Others.	Open on: Public days.	Open on: Other days.	Visitors on closed days.	Average Attendance: Public days.	Average Attendance: Other days.	Total Visitors.
January	646	316	91	165	92	11	10	8	48	127	6	1321
February	426	246	76	139	77	1	9	3	18	105	6	965
March	487	197	50	129	151	....	8	6	30	123	5	1014
April	526	263	101	299	208	11	10	3	7	140	2.3	1408
May	374	192	74	294	166	5	9	7	31	119	4	1105
June	490	93	72	187	206	3	8	5	23	128	5	1051
July	403	89	56	296	183	1	11	4	19	92	5	1028
August	411	104	69	171	140	2	8	8	32	108	4	897
September	341	186	37	158	194	5	10	6	61	86	10	921
October	387	259	71	205	186	2	9	3	58	117	19	1110
November	242	138	65	129	372	....	8	5	36	114	7	946
December	344	133	14	212	203	....	10	5	9	90	2	906
Totals	5077	2216	776	2384	2178	41	110	63	372	115	6	12,672

List of Accessions.

DEPARTMENT OF ETHNOLOGY.

Gifts.

6386-97 Collection of twelve paleolithic implements from Poondi, India. Given by H. W. Seton-Karr Esq.

6565 Wooden disk. New Zealand. Given by S. Percy Smith Esq.

6584 Coir trousers, used for armor. Gilbert Ids. Given by Mr. Harry Stockdale.

6585 Broom. Niue. Given by S. Percy Smith Esq.

6589 Basket of *ieie*. Hawaii, H. I. Given by Mrs. S. N. Castle.

6602 Pandanus bag. Eromanga, New Hebrides. Given by Miss Robertson.

6603-5 Women's skirts of pandanus. Eromanga, N. H. Ibid.

6606-7 Women's skirts of hibiscus. Eromanga, N. H. Ibid.

6608 Women's skirt of banana. Eromanga, N. H. Ibid.

6609 Women's skirt of palm and banana. Aneiteum, N. H. Ibid.

6610 Women's skirt of pandanus. Ambrym, N. H. Ibid.

6611 Man's dress of matting. Oba, N. H. Ibid.

6637 Box containing fragments of ancient kapa. Kohala, Hawaii. Given by J. S. Emerson Esq.

6638 Human bones wrapped in kapa. Kohala, Hawaii. Ibid.

6639 Collection of stone implements. South America. Ibid.

6641 Spear. Hawaiian Ids. Given by Gorham D. Gilman Esq., through Mrs. Haalelea.

6642-4 Slingstones of gypsum. Guam. Given by an officer of U. S. A. T. Solace.

6645-6 Slingstones of limestone. Guam. Ibid.

6647-9 Slingstone of basalt. Guam. Ibid.

6650 Plummet of basalt. Guam. Ibid.

6651 Plummet of gypsum. Guam. Ibid.

6652 Gouge of gypsum. Guam. Ibid.

6653 Wooden dish. Guam. Ibid.

6666 Stone lamp. Palolo, Oahu. Given by Mr. J. A. M. Johnson.

6667 Stone phallus. Palolo, Oahu. Given by Mr. J. A. M. Johnson.
6668 Stone implement. Nuuanu, Oahu. Ibid.
6669 Wooden pipe. Puuloa, Oahu. Given by A. K. Williams.

Purchases.

6510-15 Boxes for human hair. New Guinea.
6516 Small wooden mask. Ibid.
6517 Fishing net. Ibid.
6518 Longeil. Solomon Ids.
6519 Wooden female figure. Ibid.
6520 Club.
6521 Wooden dish. Matty Id.
6522 Canoe model. Ibid.
6523-4 Wooden swords. Ibid.
6525 Paddle.
6526 Club. New Hebrides.
6527 Club, pineapple. Fiji.
6528-9 Club, knobbed. Fiji.
6530 Dilly bag. North Australia.
6531-33 Pestle or pounder, stone. Hervey Ids.
6534-5 Pestle for hinai berries. New Zealand.
6536-7 Pounders for flax. Ibid.
6538 Tatuing tool, jade. Ibid.
6539 Mere. Ibid.
6540-51 Fish hooks for trolling, wood shank. Ibid.
6552-3 Fish hooks for trolling, bone shank. Ibid.
6554 Adze head, basalt. Ibid.
6555-6 Adze head, dark greenstone, polished. Ibid.
6557 Heitike of bone. Ibid.
6558 Fetish. Ibid.
6559 Carved dish for human food. Ibid.
6560 Button of albatross bone. Ibid.
6562-3 Kits of hibiscus fibre. Ibid.
6564 Shark float. Bismarck Archipelago.
6567 Adze handle. New Zealand.
6568 Feather cloak. Ibid.
6569 Albatross hook. Ibid.
6570 Canoe model. Samoa.

6571 Fish trap. Samoa.
6578 Oloná fishing net. Kauai, H. I.
6579-81 Pieces of kapa. Hawaiian Ids.
6582-3 Stone mortar and pestle. Hawaiian Ids.
6592-3 Baskets of coco leaf. Samoa.
6640 Fan. Samoa.
8737 Large boomerang, Dieyeri tribe. Central Australia.
8738 Shield. Victoria.
8739 Gouge for grooving shields. Victoria.
8740-1 Dilly baskets. Queensland.
8742 Carved nulla. Ibid.
8743-4 Engraved shields. Ibid.
8745 Wooden sword. Ibid.
8746 Bark canoe. Ibid.
8747 Stone knife with sheath. Ibid.
8748 Horned boomerang. North Australia.
8749 Shield. Northwest Australia.
8750 Dilly bag, with lip. North Australia.
8751 Club. Northwest Australia.
8752 Boomerang. Central Australia.
8753 Belt of human hair. North Australia.
8754 Necklace of native twine. Ibid.
8755-6 Dilly baskets. Ibid.
8757-9 Fishing spears, two- and three-pronged. Ibid.
8760 Axe, hafted. Western Australia.
8761 Club, "Meyarroll". North Australia.
8762 Spear, wooden, barbed on one side only. Ibid.
8763-5 Bull roarer, "Churina." Central Australia.
8766-71 Glass spear heads. Northwest Australia.
8772-4 Glass circumcision knives. Western Australia.
8775 Axe, hafted. Central Australia.
8776-7 Stone spear heads. North Australia.
8778-9 Armlets. North Australia.
8780 Club.
8781 Carved stick. New Guinea.
8782 Pillow. Ibid.
8783 Spatulate club. Ibid.
8784 Carved human figure in kneeling posture. Ibid.

Exchanged.

8721-5 Millstones. Victoria.
8726 Rasp for boomerang and spears. Ibid.
8727 Upper millstone, with finger marks. Ibid.
8728 Pounder and grinder. Ibid.
8729 Skin dresser. Ibid.
8730-6 Axes. Ibid.

Loaned.

6573 Phallic stone. Rapanui. Loaned by J. L. Young Esq.

6579 Three stone implements. Hawaiian Ids. Loaned by Mr. Henry Brower.

6670 Two koko puupuu. Hawaiian Ids. Loaned by Mr. Edgar Henriques.

RELICS.

6614-18 Daguerreotypes of Kamehameha III, Kalama and Mrs. Bishop. Given by Mrs. Henry Waterhouse.

6625 Kekuanaoa's buggy. Given by S. E. Damon Esq.

ORNITHOLOGY.

Given.

2598 Diomedea exulans Linn. Cape Horn. Given by Capt. Josselyn.

2783 Gallinago delicata (Ord), ♀. Oahu. Given by Mr. G. P. Wilder.

2784 Chen hyperboreus (Pall.), ♂. Oahu. Given by Mr. J. E. Whitney.

2785 Ocydromus earli Gray, ♂. Auckland, N. Z. Given by W. T. Brigham.

2807 Phæornis lanaiensis Wilson, ♂. Molokai. Given by R. C. L. Perkins.

2808 Phæornis lanaiensis Wilson, ♂. Molokai. Ibid.
2809 " lanaiensis Wilson, juv. Molokai. Ibid.
2810 Phæornis lanaiensis Wilson, juv. ♂. Molokai. Ibid.
2811 Palmeria dolei (Wilson) ♂. Molokai. Ibid.

2812 Psittacirostra psittacea (Gmel.), juv. ♂. Molokai. Given by R. C. L. Perkins.
2813 Psittacirostra psittacea (Gmel.), ♀. Molokai. Ibid.
2814 Vestiaria coccinea Forster, ♀. Molokai. Ibid.
2815 " coccinea Forster, ♀. Molokai. Ibid.
2816 Oreomystis flammea (Wilson), ♂. Molokai. Ibid.
2817 " flammea (Wilson), ♂. Molokai. Ibid.

Purchased.

2801 Some Moa feathers, framed. New Zealand.
2802 Apteryx haasti [?], skeleton. Ibid.
2803 " haasti [?], skeleton. Ibid.
2804 Anthornis melanocephala Gray, ♂. Ibid.
2805 Miro traversi Buller, ♂. Ibid.
2806 Sphenœacus rufescens Buller, ♂. Ibid.
3167-3233 Himatione sanguinea (Gmel.), ♂ & ♀. Hawaii and Maui.
3234-3291 Loxops coccinea (Gmel.), ♂ & ♀. Hawaii.
3292-3298 " ochracea Roths., ♂ & ♀. Maui.
3299-3383 Vestiaria coccinea Forster, ♂ & ♀. Hawaii and Maui.
3384-3438 Phæornis obscura (Gmel.), ♂ & ♀. Hawaii.
3439-3481 Psittacirostra psittacea (Gmel.), ♂ & ♀. Hawaii and Maui.
3482-3534 Heterorhynchus wilsoni Roths., ♂ & ♀. Hawaii.
3535-3553 Loxioides bailleui Oust., ♂ & ♀. Ibid.
3554-3579 Hemignathus obscurus (Gmel.), ♂ & ♀. Ibid.
3580-3592 Viridonia sagittirostris Roths., ♂ & ♀. Ibid.
3593-3617 Moho nobilis (Merrem.), ♂ & ♀. Ibid.
3618-3726 Chlorodrepanis virens (Gmel.), ♂ & ♀. Ibid.
3727-3821 Chasiempis sandvicensis (Gmel.), ♂ & ♀. Ibid.
3822-3937 " ridgwayi Stejn., ♂ & ♀. Ibid.
3938-3955 " ———, ♂ & ♀. Ibid.
3956-4039 Oreomystis mana (Wilson), ♂ & ♀. Ibid.
4040-4061 Chlorodrepanis wilsoni (Roths.), ♂ & ♀. Maui.
4062-4083 Oreomystis newtoni (Roths.), ♂ & ♀. Ibid.
4084-4092 Palmeria dolei (Wilson), ♂ & ♀. Ibid.
4093-4096 Pseudonestor xanthophrys Roths., ♂ & ♀. Ibid.
4097-4098 Oreomystis flammea (Wilson), ♂ & ♀. Molokai.
4099-4100 " maculata (Cab.), ♂ & ♀. Oahu.

4101-4113 Munia nisoria (Temm.), ♂ & ♀. Hawaii.
4114-4118 Carpodacus mexicanus obscurus McCall, ♂ & ♀. Hawaii.
4119 Alauda arvensis Linn., ♂. Oahu.
4120-4121 Telespiza cantans Wilson, ♂. Laysan Id.
4122 Moho braccatus (Cassin), ♂. Kauai.
4123-4125 Hemignathus procerus Cab. ♂ & ♀. Ibid.
4126-4131 Oreomystis bairdi Stejn., ♂ & ♀. Ibid.
4132 Phæornis myadestina Stejn. ♀. Ibid.
4133-4134 Loxops cæruleirostris (Wilson), ♂ & ♀. Ibid.
4135-4136 Chlorodrepanis parva (Stejn.), ♀. Ibid.
4137-4138 " stejnegeri (Wilson), ♂. Ibid.
4139-4140 Chasiempis sclateri Ridgw., ♂ & ♀. Ibid.
4141-4142 " gayi Wilson, ♂ & juv. Oahu.
4143 Hemignathus obscurus (Gmel.), ♀. Hawaii.
4144-4165 Micranous hawaiiensis Roths., ♂ & ♀. Ibid.
4166-4179 Charadrius dominicus fulvus (Gmel.), ♂ & ♀. Hawaii.
4180 Charadrius squatarola (Linn.), ♀. Ibid.
4181-4187 Heteractitis incanus (Gmel.), ♂ & ♀. Ibid.
4188 Tringa maculata Vieill., ♀. Ibid.
4189 Phalaropus fulicarius (Linn.), juv. Maui.
4190-4196 Arenaria interpres (Linn.), ♂ & ♀. Hawaii.
4197-4200 Calidris arenaria (Linn.), ♂. Ibid.
4201-4207 Lophortyx californica (Shaw), ♂ & ♀. Ibid.
4208-4213 Spilopelia chinensis (Scop.), ♂ & ♀. Ibid.
4214-4220 Acridotheres tristis (Linn.), ♂ & ♀. Ibid.
4221 Ceryle alcyon (Linn.), ♀. Ibid.
4222 Sterna paradisæa Brunn. Ibid.
4223 " melanauchen Temm. Ibid.
4224-4225 Numenius tahitiensis (Gmel.), ♂. Ibid.
4226-4232 Asio accipitrinus sandvicensis (Blox.), ♂ & ♀. Ibid.
4233-4251 Corvus hawaiiensis Peale, ♂ & ♀. Ibid.
4252-4280 Buteo solitarius Peale, ♂ & ♀. Ibid.
4281-4290 Fulica alai Peale, ♂ & ♀. Ibid.
4291 Æstrelata phæopygia Salvin, juv. Ibid.
4292 Puffinus newelli Henshaw. Maui.
4293-4295 Phaëthon lepturus Lacep. & Daun., ♂ & ♀. Hawaii.
4296 Fregata aquila Linn., ♀. Ibid.
4297-4299 Nesochen sandvicensis (Vig.), ♀. Ibid.

4300 Nycticorax n. nævius (Bodd.), ♀. Hawaii.
4301-4306 Chasiempis ridgwayi Stejn., nests and eggs. Ibid.
4307 Fulica alai Peale, egg. Ibid.
4308-4309 Micranous hawaiiensis Roths., eggs. Ibid.
4310-4311 Nesochen sandvicensis (Vig.), eggs. Ibid.

By Exchange.

2599 Antigone australasiana (Gould). Australia.
2601 Cacatua triton (Temm.), ♂. Rubi, N. G.
2602 Aprosmictus dorsalis (Quoy & Gaim.) ♂. Ibid.
2603 Eos reticulata (S. Müll.). Timor Laut.
2604 Electus pectoralis (S. Mull.), ♂. Waru Ceram.
2605 " pectoralis (S. Mull.), ♀. Andei, New Guinea.
2606 Trichoglossus cyanogrammus (Wagl.), ♂. Passim, N. G.
2607 " cyanogrammus (Wagl.), ♀. Ansus, Jobi.
2608 Hypocharmosyna placens (Temm.), ♀. Passim, N. G.
2609 Cyclopsittacus diopthalums (H. & J.), ♂. Dutch N. G.
2610-11 " desmaresti (Garn.), ♂ & ♀. Andei, N. G.
2612-13 Mino dumonti Less., ♂ & ♀. Passim, N. G.
2614-15 Rectes cirrhocephalus (Less.), ♂ & ♀. Dorei, N. G.
2616 Pseudorectes ferrugineus S. Müll, ♂. Rubi, N. G.
2617 Pomatorhinus isidori Less., ♀. Ibid.
2618 Pinarolestes megarhynchus Q. & G., ♀. Ibid.
2619 Piezorhynchus alecto (Temm.), ♀. Andei, N. G.
2620-1 Rectes dichrous Bp., ♂ & ♀. Wamai Arfak, N. G.
2622 Edoliisoma nigrum (Garn.), ♂. Passim, N. G.
2623 " nigrum (Garn.), ♀. Ansus, N. G.
2624 Lycocorax pyrrhopterus Bp. Halmahera.
2625 Cicinnurus regius (Linn.), ♂. Arfak, N. G.
2626-7 Chibia carbonaria Bp., ♂ & ♀. Rubi, N. G.
2628 Eupetes cærulescens Temm. Bongu, Dutch N. G.
2629 " castanonotus Salvad., ♂ (?). Sattellerg, Dutch N.G.
2630 Pitta novæguineæ Müll & Schleg, ♂. Andei, N. G.
2631 Ptilopus quadrigeminus Meyer, ♂. Bongu, Dutch N. G.
2632 " perlatus (Temm.), ♀. Rubi, N. G.
2633 Semioptera halmaheræ Salvad., ♂. Halmahera.
2634 Ptilotis megalorhynchus (Gray), ♂. Finschhafen, D. N. G.

2635 Melanocharis nigra (Less.), ♂. Andei, N. G.
2636 " nigra (Less.), ♀. Ansus, Jobi, N. G.
2637 Myiagra atra Meyer, ♂. Kordo, Mysore.
2638 Ptilotis analoga Rchb., ♂. Ansus, Jobi, N. G.
2639 Arses telescophthalmus (Garn.). Rubi, N. G.
2640 Piezorhynchus dichorus Gray, ♀. Ibid.
2641 " alecto (Temm.), ♂. Passim, N. G.
2642 " bimaculatus Gray, ♂. Batjan Id.
2643 Rhipidura fusco-rufa Scl., ♂. Timor Laut.
2644 Arses telescophthalmus (Garn.), ♀. Rubi, N. G.
2645 Machærorhynchus nigripectus Schl. N. W. New Guinea.
2646 Hypothymis puella (Wall.), ♂. North Celebes.
2647-8 " azurea (Bodd.), ♂ & ♀. Cent. Borneo.
2649 Arses telescophthalmus (Garn.), ♂. Salawatti.
2650 " telescophthalmus (Garn.). Sorong, N. G.
2651 Cyornis hyacinthiana (Temm.), ♂. Timor.
2652-3 " elegans (Temm.), ♂ & ♀. Cent. Borneo.
2654-5 Philentoma pyrrhopterum (Temm.), ♂ & ♀. Ibid.
2656 Myiagra albiventris (Peale), ♂. Upolu, Samoa.
2657 Malacopterum affine (Blyth), ♂. Cent. Borneo.
2658 " magnum Eyton, ♂. Ibid.
2659 Alcippe cinerea Blyth, ♂. Ibid.
2660 Rhipidura gularis S. Müll., ♀. Gibe (near Waigu).
2661 " perlata S. Müll., ♂. Cent. Borneo.
2662 Terpsiphone affinis Hay, ♂. Ibid.
2663 Lalage atrovirens (Gray), ♂. Mysol.
2664 " aurea (Temm.), ♀. Ternate.
2665 Pachycephala griseiceps Gray, ♂. Id. of Gaga.
2666 " caledonica (Gmel.), ♂. New Caledonia.
2667 " macrorhyncha Strickl., ♂. Amboyna.
2668 " obiensis Salvad., ♂. Obi-lata.
2669 " mentalis Wall., ♂. Ternate.
2670 " mentalis Wall., ♀. Batjan Id.
2671 Pachycare flavogrisea Meyer, ♂. New Guinea.
2672 Piezorhynchus aurensis (Salvad.), ♂. Mysol.
2673 " gutturalis (Garn.), ♂. New Guinea.
2674 " gutturalis (Garn.). Mysol.
2675 Monarcha cinerascens Temm., ♂. Little Key.
2676 " cinerascens Temm., ♂. Amboyna.

2677 Piezorhynchus chalybiocephalus (Garn.), ♂. Ternate.
2678 " chalybiocephalus (Garn.), ♀. Mayfor.
2679 Pomatorhinus borneensis Cab., ♂. Cent. Borneo.
2680 Trichostoma rostratum Blyth, ♀. Ibid.
2681 Orthotomus cineraceus Blyth, ♂. Ibid.
2682 Hydrocichla ruficapilla (Temm.), ♀. Ibid.
2683 Ptilopyga rufiventris (Salvad.), ♂. Ibid.
2684 Microtarsus melanocephalus (Gmel.), ♂. Ibid.
2685 Ægithina viridis (Bp.), ♂. Ibid.
2686 Criniger diardi (Temm.), ♂. Ibid.
2687 " tephorgenys (Jard. & Selb.), ♀. Ibid.
2688 Setaria cinerea (Eyton), ♂. Ibid.
2689 Pinarocichla euptilosa (Jard. & Selb.), ♂. Ibid.
2690 Pycnonotus simplex Less., ♂. Ibid.
2691 Phylloscopus borealis (Blas.), ♀. Ibid.
2692 Chloropsis viridinucha (Sharpe), ♂. Ibid.
2693-4 " cyanopogon (Temm.), ♂ & ♀. Ibid.
2695-6 Chloropsis zosterops Vig., ♂ & ♀. Ibid.
2697 Locustella fasciolata (Gray), ♂. Motir.
2698 Pomatorhinus isidorii Less., ♀. New Guinea.
2699 Trichostoma rostratum Blyth, ♂. Cent. Borneo.
2700 Orthonyx spinicanda (Temm.), ♂. Australia.
2701-3 Macronus ptilosus (Jard. & Selby), ♂ & ♀. Cent. Borneo.
2704 Stachyris poliocephala (Temm.), ♀. Ibid.
2705 " nigricollis (Temm.), ♂. Ibid.
2706 " maculata (Temm.), ♀. Ibid.
2707 Anuropsis malaccensis (Hartl.), ♀. Ibid.
2708 Mixornis bicolor Blyth, ♂. Ibid.
2709 Chiroxiphia parcola (Linn.). British New Guinea, S. A.
2710 Chotorhea chrysopsis (Goffin), ♂. Cent. Borneo.
2711-12 Cyanops mystacophanus (Temm.), ♂. Ibid.
2713-14 Mesobucco duranceli (Less.), ♂. Ibid.
2715 Xantholæma hæmatocephala (Müll.), ♂. Sumatra.
2716 Calorhamphus fuliginosus (Temm.), ♂. Cent. Borneo.
2717-18 Dissemurus platurus Vieill., ♂ & ♀. Ibid.
2719 Oriolus celebensis Meyer. North Celebes.
2720 " xanthonotus Horsf., ♂. Cent. Borneo.
2721 Trichoglossus cyanogrammus Wagl., ad. New Guinea.
2722 " novæ hollandiæ (Gmel.), ad. Australia.

2723-4 Loriculus galgulus (Linn.), ♂ & ♀. Cent. Borneo.
2725 Loriculus stigmatus S. Müll., ♂. North Celebes.
2726 Eos fuscata Blyth, ad. New Guinea.
2727 Melirrhophetes leucostephes Meyer, ♂. New Guinea.
2728 Arachnothera longirostris (Lath.), ♂. Cent. Borneo.
2729 Ptilotis analoga Hombr., ♂. New Guinea.
2730-1 Aplonis striata (Gmel.), ♂ & ♀. New Caledonia.
2732-4 Clyptomena viridis Raffles, ♂ & ♀. Cent. Borneo.
2735-6 Cymborhynchus macrorhynchus (Gm.), ♂ & ♀. Ibid.
2737-8 Eurylæmus ochromelas Raffles, ♂. Ibid.
2739 Merops ornatus Lath., ♀. Alor, near Timor.
2740 Nyctiornis amicata (Temm.), ♂. Cent. Borneo.
2741 Pitta müelleri (Bp.), ♂. Ibid.
2742 " cyanoptera Temm., ♀. Ibid.
2743 Monachalcyon monachus (Gray), ♀. North Celebes.
2744 Halcyon chloris (Bodd.), ♂. Batavia, West Java.
2745 Tanysiptera dea (Linn.), ♂. Amboyna.
2746 Halcyon lazuli (Temm.), ♂. Amboyna.
2747 Ptilorhis victoriæ Gould, ♂. N. Queensland.
2748-9 Harpactes duvauceli (Temm.), ♂ & ♀. Cent. Borneo
2750 Motacilla melanope Pall., ♀. Ibid.
2751 Ptilopus xanthogaster (Wagl.), ♀. Letti.
2752 Gecinus punicens (Horsf,), ♀. Cent. Borneo.
2753 Miglyptes tukki (Less.), ♀. Ibid.
2754 Rollulus roulroul (Scop.), ♂. Ibid.
2755-6 Irena crinigera Sharpe, ♂. Ibid.
2757 Artamus leucogaster (Valenc.), ♂. Amboyna.
2758 " leucogaster (Valenc.), ♂. Mysol.
2759 Manucodia chalybata (Penn.), ♂. N. W. N. Guinea.
2760 Rollulus roulroul (Scop.), ♀. Cent. Borneo.
2761 Chalcophaps indica (Linn.), ♀. Ibid.
2762 Chrysophlegma malaccensis (Lath.), ♀. Sumatra.
2763 Sasia abnormalis (Temm.), ♀. Cent. Borneo.
2764 Munia brunneiceps Wald., ♀. Cent. Borneo(?).
2765-6 Erythrura trichroa (Kittl.), ♂. Ternate.
2767 Macropteryx comata (Temm.), ♂. W. Sumatra.
2768 " wallacei (Gould), ♀ (?). N. Celebes.
2769 Dicæum trigonostigma (Scop.), ♂. Cent. Borneo.

2770 Prionochilus maculatus (Temm.), ♂. Cent. Borneo.
2771-2 " xanthopygius (Salv.), ♂ & ♀. Ibid.
2773 Melanocharis nigra (Less.), ♂. New Guinea.
2774 " nigra (Less.), ♀. Salawatti.
2775 Æthopyga siparaja (Raffles), ♂. Cent. Borneo.
2776 Anthothreptes simplex (S. Müll.), ♀. Cent. Borneo.
2777 " phœnicotis (Temm.), ♂. Ibid.
2778 " phœnicotis (Temm.), ♀. Ibid.
2779 " simplex (S. Müll.), ♂. Ibid.
2780 Cinnyris frenata (S. Müll.), ♂. New Guinea.
2781 " frenata (S. Müll.), ♀ (?). Mysol.
2782 Cinnyris zenobia Less., ♂. Amboyna.

CONCHOLOGY.

12,000–15,000 specimens of Mollusca belonging to the genera Achatinella, Amastra, Leptachatina, Auriculella, Tornatellina, Helicina, etc., have been added to the collection. Several fine series have been given or loaned for study by Prof. H. W. Henshaw, Mr. D. D. Baldwin, Mr. D. Thaanum, and Mr. A. F. Judd.

MISCELLANEOUS.

6566 Piece of jade. New Zealand. Purchased.
6572 Corals. Samoa. Purchased.
6575 Tuatara (*Hatteria punctata*) New Zealand. Purchased.
6576 Tuatara (*Hatteria punctata*). New Zealand. Given by the New Zealand Government.
6586 Large quartz crystal. Dungog. Given by J. H. Mackay Esq.
6594 Reptiles. Australia. Given by Mr. Harry Stockdale.
6595 Insects (Deinacrida). Stephens Id., N. Z. Given by H. Travers Esq.
6597 Hippocampus. New Zealand. Given by H. Travers Esq.
6612 Tubercles from papaya. Honolulu. Given by Henry Holmes Esq.
6636 Silver sword (*Argyroxiphium sandvicense*). Given by Mr. Aiken.
6672 Quartz crystals. Oahu. Given by Mr. Arthur Alexander.

6676 Eel. Honolulu. Purchased.
6677 Hydroid. Hawaii. Given by L. A. Thurston Esq.

Large collection of corals made at Kahana and Kaneohe bays, Oahu, and Pukoo harbor, Molokai, now being identified by Dr. Vaughan in Washington.

LIST OF ADDITIONS TO THE LIBRARY.

Those received by exchange are denoted by an asterisk.

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217. Some Plant Foods of the Aborigines.
256. Indigenous Vegetable Drugs, parts 1, 2.
282. Native Food Plants.
313. The Valonia Oak.
331. Flora of Mt. Kosciusko. Second Contribution.
351. Some Remarks on the Sand-drift Problem.
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LIST OF EXCHANGES.

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American Museum of Natural History. New York.
American Philosophical Society. Philadelphia.
Amherst College Library. Amherst, Mass.
Anthropological Institute of Great Britain and Ireland. London.
Anthropologischer Gesellschaft. Berlin.
Anthropologischer Gesellschaft in Wien.
Asiatic Society of Bengal. Calcutta, India.
Auckland Institute. Auckland, N. Z.
Australian Museum. Sydney.
Boston Public Library.
Boston Society of Natural History.
Brooklyn Institute of Fine Arts and Sciences.
California Academy of Sciences. San Francisco.
Canterbury Museum. Christchurch, N. Z.
Carnegie Institution. Washington, D. C.
Carnegie Museum. Pittsburg, Penn.
Colonial Museum. Wellington, N. Z.
Columbia University Library. New York.
Connecticut Academy of Arts and Sciences. New Haven.
Dartmouth College. Hanover, New Hampshire.
École d'Anthropologie de Paris.
Field Columbian Museum. Chicago.
Free Museum of Science and Art. Philadelphia.
Geological Survey of New South Wales. Sydney.
Gordon Technical College. Geelong, Australia.
Harvard University Library. Cambridge, Mass.
Hawaiian Evangelical Society. Honolulu.
Hawaiian Historical Society. Honolulu.
Hilo Public Library. Hawaii.
Honolulu Library Association. Honolulu.
Indian Museum. Calcutta, India.
Jardin Botanique de Buitenzorg. Java.
Johns Hopkins University. Baltimore.
K. K. Naturhistorische Hofmuseum. Wien.
Kongl. Vitterhets Historie och Antiqvitets Akademien. Stockholm.
Königliche Ethnographische Museum. München.

Konigliche Museum für Völkerkunde. Berlin.

Konigliche Zoologische und Anthropologisch-Ethnographische Museum. Dresden.

Leland Stanford Jr. University. California.

Library of Congress. Washington.

Linnean Society of London.

Linnean Society of New South Wales. Sydney.

Madras Government Museum. Madras, India.

Marine Biological Association of the United Kingdom. Plymouth.

Maryland Geological Survey. Baltimore.

Mexico Instituto Geologico.

Museo Civico di Storia Naturale di Genoa.

Museo Nacional de Buenos Aires.

Museu Goeldi. Para, Brazil.

Museu Paulista. Sao Paulo, Brazil.

Museum of Comparative Zoology. Cambridge, Mass.

Museum of Fine Arts. Boston.

Museum für Natur-, Völker- und Handelskunde. Bremen.

Museum für Völkerkunde. Leipzig.

New Zealand Institute. Wellington.

Oahu College. Honolulu.

Peabody Academy of Science. Salem, Mass.

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Philadelphia Commercial Museums.

Polynesian Society. Wellington, N. Z.

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Royal Geographical Society. London.

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Royal Society of New South Wales. Sydney.

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Royal Society of South Australia. Adelaide.

Royal Society of Victoria. Melbourne.

Smithsonian Institution. Washington.

" " Bureau of American Ethnology. Washington.

" " U. S. National Museum. Washington.

Società Italiana di Antropologia e Etnologia. Firenze.

Société d'Anthropologie. Paris.

Société Royale des Antiquaires du Nord. Copenhague.

Société Royale Malacologique de Belgique. Bruxelles.

South African Museum. Capetown.

South Australian Museum. Adelaide.

Tufts College. Mass.

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University of California. Berkeley, Cal.

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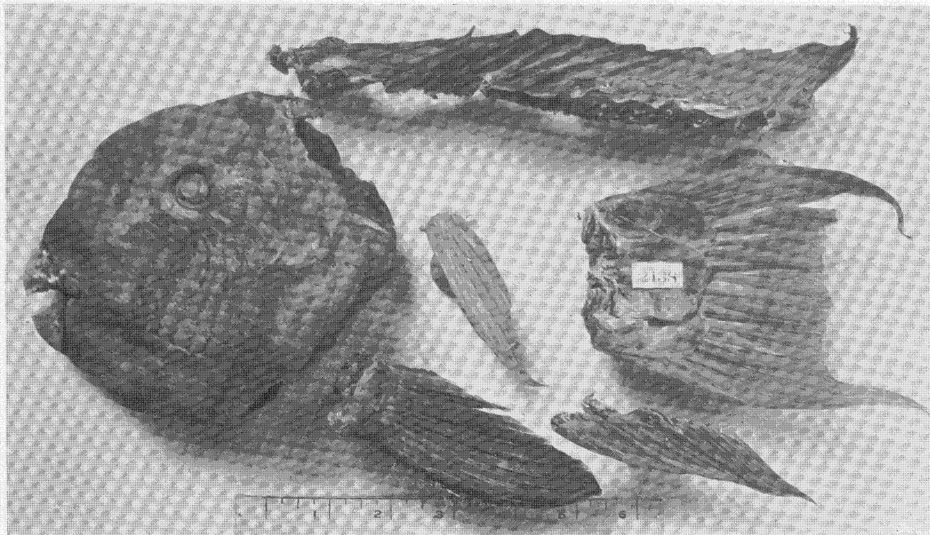


SCARUS BRIGHAMI BRYAN & HERRE. NEW SPECIES.

The half-tone reproduction of the head and fins of the type specimen of this large and remarkable Parrot-fish, which is named in honor of Dr. Wm. T. Brigham, Director of the Bernice Pauahi Bishop Museum, was prepared for Bryan's Monograph of Marcus Island where the fish is described. [Oc. Papers B. P. B. Mus., Vol. ii, No. 1, p. 131, 1903.] The plate was not ready when the monograph went to press, and in consequence is here published for the first time.—WM. ALANSON BRYAN.

Australian Bark Canoe.

BY WM. T. BRIGHAM.

IT was my good fortune during my last visit to Australia (January, 1904) to find a specimen of the bark canoe made by the natives of the north coast. The blackfellows of Australia are not industrious, and their productions are usually much in the nature of make-shifts. Neither are they a seafaring race, and their boats do not show the results of long use or experience. Still they had along the coast many rivers to cross when not all could swim, and the floods of the country sometimes converted broad plains into temporary lakes, so there was need of some simple craft as ferry. Several forms of these rude boats, made for present use and seldom very durable, have been described, but the one in this Museum (Fig. 1) differs from any I have seen or that have been described or figured. The nearest to it is the one figured by Spencer and Gillen,[1] but that is a much more elaborate canoe, 17 ft. long and with a beam of 2 ft., capable of carrying a number of persons. Besides the authors referred to R. Brough Smyth[2] has described and figured several forms; one of thick bark where the ends could not be brought together but were closed by walls of clay: another of more flexible bark where the ends were crumpled together and tied with a stout cord, the sides being kept apart by stretchers. The one under consideration is a little more elaborate than either of these last and conforms more nearly to our ideas of a canoe. It is a single piece of bark (*Eucalyptus rostrata* was preferred) bent and sewed firmly together at the ends, the stem being pointed, the stern more blunt. The gunwale is formed on each side by a tough mangrove stick to which the edge of the bark is attached by sewing over and over with strips of reed. These sticks are tied together at the bow and there project slightly; they extend to within a few inches of the stern and thus allow the bark to spread slightly there. Where a split along the grain of the bark occurred a suture was made over a stick well paid with gum, and gum was also used to calk the end seams. The tendency to spread was checked by bindings of a rattan-like material. The dimensions of this tiny canoe are,

[1] The Northern Tribes of Central Australia, London, 1904, p. 680.
[2] Aborigines of Victoria, I, p. 407.

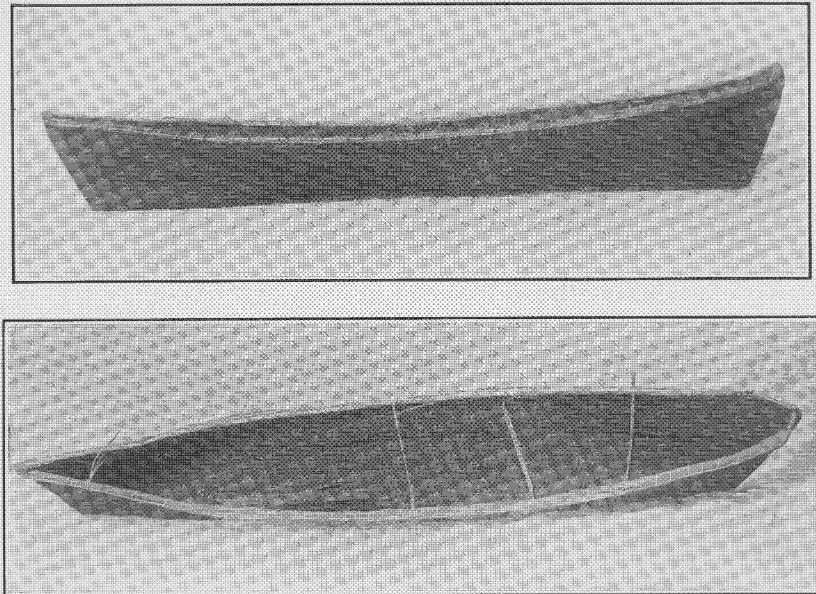


FIG. I. AUSTRALIAN BARK CANOE.

7 ft. in length over all, 18 in. beam, 9 in. depth. There were no thwarts, and the slim, lithe native sat on the bottom, or often on a mat of the same bark of which the canoe was made, and paddled with a short length of palm leaf gathered and tied at one end like a scoop. In shoal water he preferred to pole the light craft. Like the birch-bark canoe of the North American Amerind these Australian canoes were light and easily transported over land, and when not in use were carefully cached in the liminal thicket.

It is not surprising that the early voyagers, and even some of a later day who were careful observers should have supposed that the Australians had no canoes, except the dugouts they secured from the Malay traders along the northern shores. Not only were those made by them small and inconspicuous, but they were not in common use where the white man was likely to go. Smyth gives, in the work already referred to, a full account of the incorrect statements of travellers about Australian boats.

A Stone Dagger for Duelling.

BY WM. T. BRIGHAM.

ANOTHER of the interesting implements that I brought back from my recent visit to Australia was a stone dagger neatly made by splitting from quartzite and handled in a suitable way with a ball of the tenacious gum used by the natives and called by the whites "black boy." As shown in Fig. 2, the dagger is provided with a sheath of bark ornamented to a greater extent than common with Australians. The total length is 7.5 in. The most remarkable thing about it is the use to which it is dedicated, although as in the case of most primitive implements it served many purposes. Thus among the Arunta tribe, to which this dagger belonged, in former times, a fire-stick was also used to circumcise boys, before this stone knife was found more suitable.

Two men in fighting with this weapon clasp arms about each other's naked body and cut into the opponent's buttocks and thighs, but the rules of the game seem to prohibit cutting else-

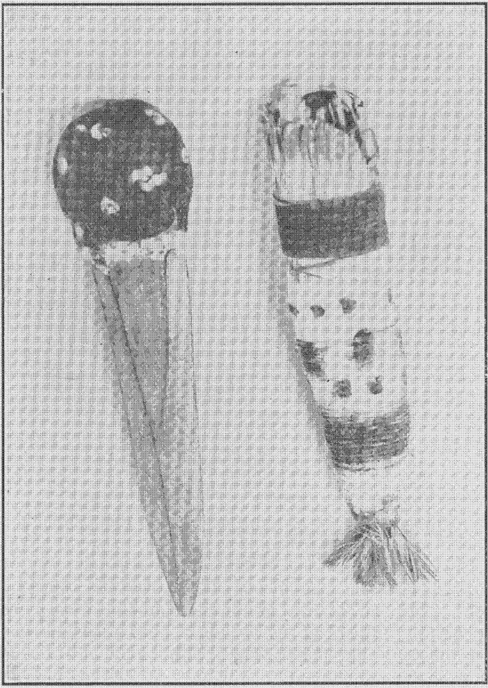


FIG. 2. STONE DAGGER FOR DUELLING.

where, as in the small of the back, where mortal injuries could easily be inflicted with a knife of such length. One at last from loss of blood has to acknowledge himself beaten, but in this duel both combatants must be well punished. The wounds are plugged with herbs and mud and after a while the duellists can sit down

again. Few of the blackfellows are free from scars of wounds inflicted by these stone knives.

Spencer and Gillen call attention[3] to the curious fact that however old these knives may be they always look new and unused. The quartzite is easily cleaned from blood, and the natives show care in keeping the knives free from dirt as they are also used for circumcision and subincision (mika operation) as well as for cutting food and for the ordinary needs of life.

The sheath is made of many layers of the paper-like bark of the "tea-tree" (*Melaleuca leucodendron*) placed close together and wound (in the present specimen) with two bands of cord twisted from fur and vegetable fibre mixed; the whole decorated with white pipe-clay and red ochre. The tip is decorated with a bunch of emu feathers. Unless considerable care is taken the sheath is liable to become choked by the point of the knife cutting and pushing down parts of the leaves. While the globular handle is usually made of the resin obtained from the porcupine grass (*Triodia*), in the extreme north this grass is not found and wax is substituted, although not so hard. This specimen, No. 8749, is from the collection of Mr. Harry Stockdale of Sydney.

Notes on the Birds of the Waianae Mountains.

WM. ALANSON BRYAN.

THE following notes and observations on the birds of Oahu were made by Mr. A. Seale and the writer during a collecting trip into the Waianae Mountains, undertaken in the interests of the Bishop Museum. January 21, 1901, found us in the field where we remained until March 9, with the exception of a few days (February 3 to 19), during which time terrific rain storms forced us to suspend our work and leave the mountains.

For much of the success of the trip our thanks are due Mr. W. A. Buick, manager of Leilehua Ranch, who in addition to rendering us assistance in many ways kindly placed Pukaloa cabin at our disposal. This mountain house, which is admirably located

[3] The Northern Tribes of Central Australia, p. 655.

as a centre for field work in the Waianae Mountains, is on the windward side of the range at the lower edge of the present timber belt, yet within a few hours climb of the summit of Mt. Kaala (4030 ft.), which is the highest point on the island.

The long knife-like ridges and deep, narrow, intervening valleys of this group of beautifully sculptured mountains are generally more or less thickly wooded with Koa, Ohia and Kukui, which are the characteristic indigenous forest trees of the island. An undergrowth of vines, shrubs and ferns which mat the ground in favorable localities make the forest in many places an almost impenetrable jungle. This circumstance, taken in connection with the rough and uneven character of the mountain side, makes for the ornithologist one of the most difficult collecting grounds immaginable.

From various causes the timber, which in early times covered the mountains and extended far down the valleys, is fast dying out, and yearly the feeding grounds for the nectar-loving avifauna are becoming more and more limited in extent. I have roughly estimated that today but one-twentieth of the area of the island which was wooded formerly is covered with verdure suitable to harbor and sustain the bird life which is peculiar to these islands. If the mountains are still further denuded of forest the Iiwi, Apapane, Amakihi and Elepaio, which are now far from abundant, must necessarily from lack of suitable food, ere long succumb to the inevitable and add their names to the now too long list of extinct birds of this island.

The heavy rain and continued gloomy weather which interrupted our work was most unfortunate. Appreciating the fact that little or nothing is known concerning the nidification of the native birds our visit had been planned so as to bring us in the field at the most favorable time for investigation along that line. I had succeeded in locating and marking for further study a dozen partially completed nests before the storm broke causing the birds to abandon all of them. However, the results worthy of notice are appended believing they will be found of some general interest as well as a basis for farther study.

Phaëthon lepturus Lacép. & Daun.

The White-tailed Tropic Bird was noted on a number of occasions during our stay sailing gracefully about the abrupt cliffs, particularly on the leeward side of the range. No specimens were secured, and the number of individuals seen would indicate that it is by no means abundant. I have no doubt but that they find suittable niches among the crags in which to nest and rear their young.

Fregata aquila Linn.

The Man-o'-war Bird, or Iwa of the natives, is but seldom seen any distance inland. However, on one occasion a bird was seen high in the sky and at a considerable distance out toward the sea which I at once referred to this species.

Anas wyvilliana Scl.

On January 23, while returning to the camp at sundown, a pair of native ducks, *Koloa maoli*, were flushed from the little stream in Pukaloa Valley. The pair were seen mornings and evenings during the first few days of our stay, but eventually entirely left the vicinity of our cabin.

Charadrius dominicus fulvus (Gmel.).

The Golden Plover were abundant on the uplands; hundreds of individuals were seen daily.

Arenaria interpres (Linn.).

The Akekeke, though at no time abundant, was not infrequently seen on the plains and ridges at from 1000 to 2000 feet elevation.

Phasianus torquatus Gmel.

The Ring-necked Pheasant has been introduced to the Islands and is common in the Waianae range. Hybrids between this species and the Japanese Pheasant are not uncommon; many of them rival the pure-blooded birds both in point of size and beauty.

Phasianus versicolor Vieill.

Like the last, the Japanese Pheasant has been succesfully introduced here, and about our camp this was the more abundant of the two species.

Turtur chinensis (Scop.).

Occasional individuals of the introduced dove were seen in the forests. One nest was taken.

Asio accipitrinus sandvicensis (Blox.).

At nightfall on several occasions the Pueo was noted sailing about in quest of food. I secured one male specimen on January 28 which seems to fall well within the measurements given for this sub-species. The bird was 13.25 in. in length, with the wing 11.15 in., tail 5.40 in., and the tarsus 1.60 in.

Alauda arvensis Linn.

One of the most successful attempts at introducing birds into the Islands brought us the skylark. They are rapidly becoming abundant in suitable localities, particularly in the upland pastures. Nowhere on the island are they to be more commonly met with than on the plains between the Waianae and Koolau range at Wahiawa.

Chasiempis gayi Wilson.

This interesting, industrious little fly-catcher, commonly known as the Elepaio, is much more frequently met with in the Waianae mountains than in the Koolau range back of Honolulu, a fact which might be regarded as indicating that while it does not fear man or consider him as a serious natural enemy, it thrives better in more secluded and inaccessible retreats.

Bearing in mind the note given by the Hon. Walter Rothschild in Avifauna of Laysan (p. 76), where he states that "Palmer and his assistants have also seen the rufous-rumped bird on the nest and feeding their young, although less frequently than the white-rumped birds," and the farther remark quoted from Mr. Palmer's diary for April, 1893, saying that "I (Palmer) saw a pair, one bird rufous-rumped, and the other white-rumped, build a nest. I think they change their rufous plumage into the white in the second year if not later." We were naturally expecting to make some interesting observations on the point touching on the age at which the Elepaio assumed the duties as well as the dress of the adult breeding bird. Our observations were timely since they were made in the height of the spring nesting season, and though

it was my good fortune to see several pairs building their nests, and still more mating, in no instance did I observe a rufous-rumped immature bird nesting or mated with a white-rumped bird or in any way connected with the nest-building operations of the latter. A splendid series of birds in both phases of plumage was secured, and not a few nests and parent birds were collected, with an eye single to this point, and as a result my observations lead me to question somewhat the conclusions drawn by Mr. Palmer in this instance.

We found the white-rumped birds mated and settled, usually within calling distance of their kind; and occasionally, by the most painstaking efforts we were able to discover the beautifully concealed, and consequently much desired, nest. I have put in hours at a time watching these happy little workers as they flit about from branch to branch, cocking their heads first on this side then on that, picking a green larva from a leaf, or now and then making a dart out in true fly-catcher fashion to take some unwary insect on the wing. Feeding around over a somewhat limited area, returning again and again to the same tree; now and then giving a pleasant, clear whistle, *Ele-pai-o*, this charming little enthusiast may be found at his labors all day long. When it observes an intruder it will approach quite near and scold *Chur-chur*, *chur*, *chur-chur*, at which its mate will join in the protest. If they find that nothing comes of their joint efforts, they will resume their feeding and calling. On visiting the locality on the next day or the next week, by sitting down and patiently waiting and giving the little kissing sound, which is so easily imitated by applying the tip of the finger to the lips, the pair, of former acquaintance, will soon answer and return in person to ascertain the cause of the call, always approaching very near to peer at one in wide-eyed curiosity.

My note book for January 23 states that about 9 a.m. I came on a *C. gayi* (Mus. No. 1543) working away at a nest which it had built on a slender side limb of an Ohia tree, about twenty feet from the ground. I watched the bird for twenty or thirty minutes and decided that the nest must have young in it, as the mother bird would come bringing objects to it which I took to be food for her family. In the afternoon we came again, and, after some observation of the old birds, took a picture of the nest in the tree.

The nest was then secured, with no little difficulty, and proved to be newly made and quite complete, with the exception of the inner lining, but unfortunately contained no eggs. The nest (No. 1670, Fig. 1) was placed on a nearly horizontal limb an inch in diameter, onto which it was saddled very firmly. It was almost hidden from view in the leaves and branches which surrounded it. The materials used in its construction are chiefly the skeletonized leaves of a number of mountain plants interwoven with moss. This moss is firmly bound together and to the limb with an abundance of spider

1669 1670

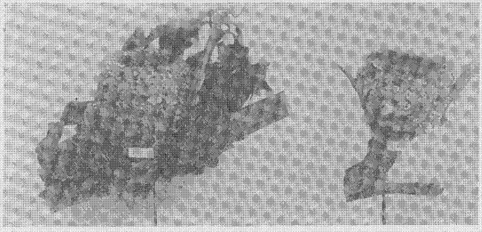


FIG. 1. NESTS OF THE ELEPAIO, CHASIEMPIS GAYI WILSON.

webs, which hold it in form and make it perfectly firm. The outside of the nest is decorated with bits of lichens from tree trunks which are also attached by the use of webs. The outside dimensions are 2.75 in. in width by 2.50 in. high.

On January 26 a nest was located in a tree growing well down on the side hill in a little valley behind the cabin. The spot was revisited two or three times at intervals, before the storm, when the birds were to be seen, always enthusiastic in the adding of the finishing touches to their little home; but, alas, the rains descended, and when the nest was finally taken, on March 2, it was deserted and dilapidated. In the choice of materials used in its construction it was almost identical with the one described above, but was located in a horizontal fork at the extreme end of a horizontal limb, much after the fashion of the Veiros of America.

The next nest taken (Mus. No. 1672, Fig. 2) was located on January 28 well up among the top branches of a Lama tree (*Maba sandwichensis*) twenty-five feet from the ground. The old bird would bring moss and leaves to the nest, place them inside and then get into the bowl of the nest and swell herself up as large as possible, thus forcing the material into place and at the same time making the nest solid and round from within. This time the birds had chosen as a nesting site a vertical crotch where a small branch had been broken out. The structure was bound together and fastened in place as before. To this one the lining had been added, being made entirely of the fine seed stems of the Pili grass. My record for February 22, the date when I took this nest, states that I again visited the nest of *C. gayi* noted on January 28 and subsequently. I found it apparently deserted. On climbing the tree the bird darted past my head two or three times. I secured the nest and branch, both

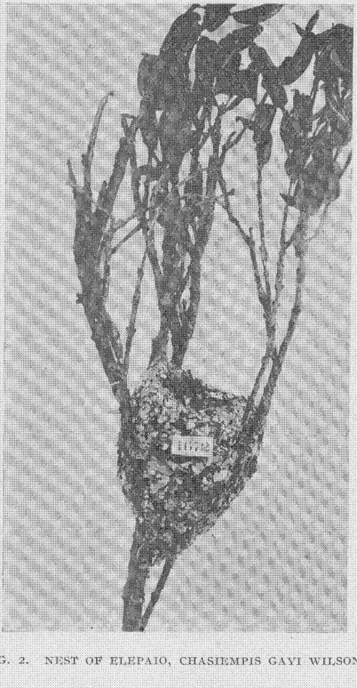


FIG. 2. NEST OF ELEPAIO, CHASIEMPIS GAYI WILSON.

of which were covered with lichens. The nest wasbadly weather-beaten, no repairs had been made since the kona storm. The tree was growing down from the crest of the ridge some forty feet, and was thus somewhat sheltered from the wind. Later, on the same day, while watching a fly-catcher I saw it go to its nest in an Ohia tree some fifteen feet up from the ground. I shot the bird (Mus. No. 1651) which had its beak full of nest materials. I also took the nest (Mus. No. 1669, Fig. 1). It was weather-beaten, and I believe undergoing repairs. This nest, similar to the last, was placed in a vertical crotch at the top of the tree, and in general it resembled the foregoing in size and structure, with the exception that it was being lined with the black hair-like stems of a small fern.

Still another nest, taken on March 2, had been located while it was building, over a month before. It was placed in a slanting limb an inch in diameter, some twenty feet up in a tree which was growing close down beside a little stream. Like all the nests secured it was composed of leaf skeletons, moss and lichens firmly bound together with spider webs, and in this instance was lined with seed stems of the Pili grass. Over all it was 3.25 in. high by 2.50 in. across. The bowl of the nest is 1.25 in. deep and 1.75 in. across the brim. When taken the nest contained one fresh egg, which is ovate in form, measuring .80 × .60 in., with a white or creamy white ground and faint lilac under spots, over which are brown surface specks and spots distributed generally over the shell, but are the most numerous at the larger end. I find the measurements of *C. gayi* eggs given by Rothschild is in error (1.25×1.11), being out of all proportion to the size of the bird. He farther states that his specimen is "covered with small spots and blotches of a brownish red (brick red)", so that in all probability the egg thus described by him is that of some other species.

The remaining nest, one taken on March 4, does not vary either in size or material sufficiently from those described above to warrant a separate description. It was secured from a limb eighteen feet from the ground.

Acridotheres tristis (Linn.).

Several Mina birds were secured. They are found quite commonly in flocks all through the mountains, and at this season of

the year were exceedingly noisy, being engaged in the preliminary battles or trials of valor which later in the season lead to their mating and nesting. It might be well here to say that at no time during our protracted stay in the field, did we see a Mina in any way molest one of the native birds, nor did I find a nest which gave any signs of having been disturbed by one. My observations lead me to believe that the introduction of the Mina has had little or nothing to do with decrease in the numbers of the native avifauna, notwithstanding a popular belief to the contrary.

Carpodacus mexicanus obscurus McCall.

A number of the bulky globular nests of the so-called "Ricebird" were collected. The birds themselves were but seldom seen in the mountains during the heat of the day, though they were very abundant about our camp early in the morning and again at nightfall. They evidently leave the forest in the morning to go to the low rice and pasture lands not far distant to feed, returning to the mountains to roost. I was not able to detect any decided preference in the matter of selecting a nesting site. They seem to easily adjust themselves to their adopted surroundings, using any of the several species of trees that offered a forked limb that suited their taste, without any notice being taken as to its height from the ground.

Munia nisoria (Temm.).

The little "Chinese Sparrow" was not to be passed by without being seen on a few occasions, and two specimens were collected. They are by no means as common in this range as in the mountains and valleys back of Honolulu.

Vestiaria coccinea Forster.

The Iiwi is by far the rarest of the five species of mountain birds yet to be found on Oahu. It is to be regretted that hours of patient search in the deep, quiet, shady valleys where the few specimens met with seemed to prefer to be, only resulted in our securing six specimens,—three adults (both sexes) and three valuable immature specimens. No nests were taken, though I saw indications of their mating. As yet the eggs of this species are unknown to science. However, Mr. Seale has elsewhere (see

Occasional Papers of the B. P. B. Museum, vol. i, no. 3, p. 42) described a nest, now in the Museum, which accords very closely with the one figured by Mr. Wilson.

Himatione sanguinea (Gmel.).

An excellent series of the Apapane was secured. The fact of greatest interest in connection with it perhaps is, that there was not a single individual in the entire lot but what was in the plumage assumed by the fully adult male or female. This seems to be a sufficient prèmise from which to conclude that this species arrives at its mature plumage within one year from the nesting stage, and furthermore that all birds in that plumage breed.

The first reference to the nesting of this species occurs in my journal under date of January 26, "when I came upon a nest which was placed about fifty-five feet up in an Ohia tree. The birds were exceedingly wary, being seen in the vicinity of the nest for a few seconds only." Again, on January 28, "I made a climb almost to the top of the ridge, when I turned back down through the Koa forest (which was in full bloom) where I found and marked another nest of *H. sanguinea* which was just building in an Ohia tree. These nests were destroyed by the storm alluded to above. On March 7 I secured a partially completed nest of this species which was placed in a tree in a thick clump of Ohia. It is composed externally of twigs and moss, neatly woven together; on the inside it is lined with fine rootlets. It was somewhat dilapidated, evidently having been recently deserted. In all the essential details, except the quantity of material used, it agrees with the nest taken March 27, 1900, by Mr. Seale which contained a fragment of an egg shell that would have approximately measured .85 × .55 in. The shell is whitish as a ground color, on which is flecked dark lilac spots or blotches.

Chlorodrepanis chloris (Cab.).

We secured a splendid series of the Amakihi in which I find adult birds of both sexes together with immature birds in several plumages. The six nests which I secured were weather-beaten and bore evidence of having been used in the rearing of a brood some little time before our arrival, possibly being a year old. The nest taken January 28 was in the best state of preservation.

The site chosen was in a stunted Ohia growing in rather open scrub on the mountain side at an elevation of from 1800 to 1900 feet above the sea. It was seven feet up from the ground in a vertical crotch. The outside diameter of structure is about three inches; the diameter of the bowl is 1.75 in., with a depth of about 1.25 in. The coarser materials, used in the outside of the nest are the soft blades of the Pili grass. The lining is made up of fine rootlets together with the silky fibre (Pulu) which is gathered from a large tree fern. Another nest, taken at about the same altitude from an Ohia tree, thirty feet up from the ground, agrees with the nest just described in size, shape and material, with the exception that some Pili grass stems have been introduced into the lining. A dilapidated nest was taken on January 30. It was found in the open scrub, five feet or more from the ground. February 27 a nest was taken from thirty feet up in an Ohia tree which agrees closely with the foregoing specimens. Later in the day on the last mentioned date a most interesting and unique nest was collected. It was placed in a large fern, down close to the stem and within a foot of the ground. The plant which held this specimen was growing at some 2500 feet elevation on the very top of a ridge which was exceedingly narrow and precipitous. The Pili grass which entered into the composition of the nest taken on January 28 was here replaced by a judicious use of moss, but the bulk of the material was pulu. Though I saw nothing of the parent birds I am satisfied that this is the nest of *C. chloris*.

These birds frequent the blooming Koa, as well as Ohia, and are usually found in loose flocks from four to six in number, On alighting in a tree they go industriously to work looking it over for insects. This operation only requires a few minutes. When they have exhausted the food possibilities of the tree in question they will all take wing at a call note from their leader and fly away to another tree and there continue their feeding. They seem to prefer to feed among the smaller terminal twigs of the Koa, though specimens were collected from all the various species of trees common in the mountains, and not infrequently they were found in quite low scrub and bushes. Just at this season of the year they seem to be unusually quiet, rarely uttering more than a faint occasional *tswe-et*.

Oreomystis maculata (Cab.).

Fifty years have passed since Cabanis described and named this species as occurring on Oahu—the most populous island of the group. Previous to the present record its nest and eggs had never been taken, or at least had not been reported. This species seems to be fairly well restricted in its range to the forest belt of the Waianae mountains. They are exceedingly industrious birds,

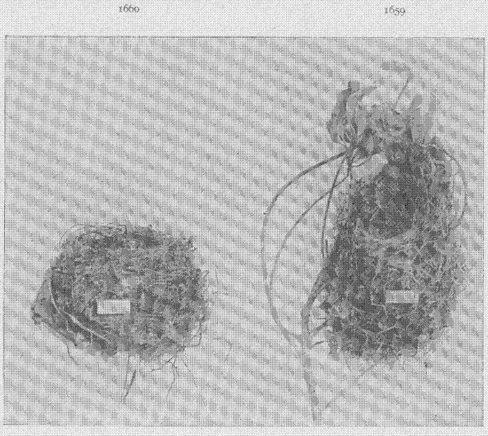


FIG. 3. NESTS OF OREOMYSTIS MACULATA (CAB.).

found associated together in small unorganized flocks of a half dozen individuals, which usually keep within hearing distance of the rather plainly whistled *cherk!* which is uttered by first one, then another, as they carefully search the bark of the tree trunks and the larger limbs for insects, which form the staple article of their food. However, they occasionally extend their feeding grounds so as to include the smaller branches and twigs, where, barring the difference in the notes uttered by the two species, they might easily be mistaken for *C. chloris*, which they resemble quite closely at a short distance.

The first nest taken (B. P. B. Mus. No. 1659, Fig. 3) I found on January 29 in the top of a bush, eight feet from the ground, where it was loosely, though daintily, attached to the small twigs and leaves surrounding it. The outside measurements are 3 in. across by 3.50 in. deep; inside it is 2 in. across by 1.50 in. deep Externally it is composed of fine dry club moss and pulu fibre, which is bound together and in place by spider webs; inside there are a few leaf skeletons and fine rootlets. The nest when taken was not quite complete, but as it was on a steep mountain side in a tangle of scrub, vines and ferns, I decided to take no chances and accordingly collected it, as well as the bird, which was near at hand. The following day (January 30) Mr. Seale secured a nest (B. P. B. Mus. No. 1660, Fig. 3) which contained two fresh eggs, from a Kukui tree, some twenty feet from the ground. With it he collected both parent birds, making the record most complete and satisfactory. The nest, like the one just described, was loosely attached to the surrounding leaves. It is composed of roots and moss, and lined inside with fine rootlets. The eggs have a creamy white ground color, into which is worked the pale brown under markings. Over these are sprinkled the redder brown spots which form an ill-defined wreath about the larger end, though they are thinly scattered all over the surface. Carefully measured they are .80 × .58 in. and .78 × .60 in. respectively. This nest and eggs are plainly one of the best finds of the trip.

Additional Notes on the Nesting Habits of the Hawaiian Owl.

BY WM. ALANSON BRYAN.

IN The Auk (vol. xix, 1902, p. 299) I recorded our first information concerning the nesting habits of the Pueo (*Asio accipitrinus sandvicensis*). The note was based on a nest from Kalihi Valley, Oahu, that was brought to my attention November 20, 1901. When found it contained four young birds still "in the first downy plumage, the wing quills not having burst the capsules." I here

add to the record cited an account of a second nest secured at Kalauwai, on the island of Molokai, March 6, 1905, by Mr. A. F. Judd of Honolulu.

The nest, which was a simple structure resembling the one previously described, was hidden in the Pili grass in a mountain pasture having a western exposure, at an elevation of between eight and nine hundred feet. It contained three young birds and one infertile egg. All were brought to Honolulu and presented to the Museum by Mr. Judd. The little owls were kept alive for some time by Dr. Brigham at his residence. They grew rapidly from the first on a diet of raw beef, to which a mouse was occasionally added. When secured they were little more than fluffy balls of buff-colored down, from which peered bright, staring, yellow eyes. Within a few days the down disappeared, to be followed by the plumage of the young with the characteristic colorings of the adult. However, their development was too rapid, for on the slightest provocation—perhaps while simply flapping about as they gave voice to their tremulous screech in joyous expectation at the prospect of food—the long bones of the wing would, without apparent cause, bend and break. As a result they were, of necessity, prepared as museum specimens, and when compared with the young from the Oahu nest exhibited no differences worthy of note.

The egg (B. P. B. Mus. No. 3163) of this species, which is here described for the first time, is a thick oval, slightly pointed in form; pure white and lustreless in color, with no shell markings other than nest stains. It measures 1.51×1.22 in. The interesting feature connected with this nest is that we now have two widely differing dates (November 20 and March 6) as nesting periods for the Hawaiian owl. As the American short-eared owl—the nearest relative of our Pueo—nests regularly in the early spring and does not rear a second brood we are led, for the present, to conclude that the equable climate of the islands has encouraged this species to become exceedingly lax in fixing a nesting season; or else that both the spring and the fall are taken advantage of for the purposes of nidification.

Description of the Nest and Eggs of Chlorodrepanis virens (Gmel.).

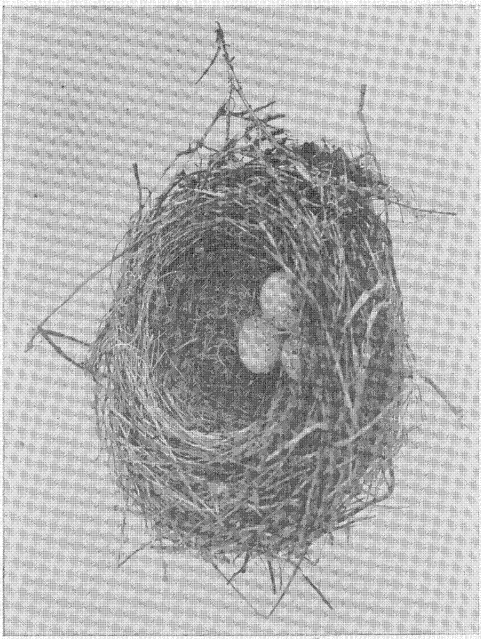
WM. ALANSON BRYAN.

THE Museum is indebted to Mr. C. E. Blacow for a well identified nest containing three eggs of the Hawaii Amakihi which were collected at Horner's Ranch, in the Hamakua district, on May 3, 1905. Mr. Blacow states that the parent bird was on the nest when it was found, thus establishing its identity. It is about four inches across by two and one-half inches deep; externally it is composed of fine twigs and bits of grass; the lining is of cream-colored lichens, such as are common in the forests in the rainy districts. Into the coarse materials are woven a number of the balloon-shaped egg cases of certain species of spiders. These somewhat resemble the husks of the Poha (*Physalis peruviana*), and are possibly what Mr. Perkins identified as such. The structure is neat, compact and well made. The eggs have a creamy white ground which is covered with pale lilac and smoke-grey freckles crowded together at the larger end to form a cap-like zone. The eggs are remarkably uniform in size, shape and color, measuring $.57 \times .72$ in., $.55 \times .73$ in., $.56 \times .74$ in. respectively.

Mr. Palmer has reported (Avifauna of Laysan, p. 134) that "On May 5 one was seen carrying moss or some other green material as if for building a nest. On May 17 three nests were found, but all empty. They were very much like the one received from Mr. Baldwin, and were outside built of sticks, then of moss and lined with fine roots, open above, and about two and one-half inches in diameter." Mr. Perkins, without giving the exact season, states that "I have found the nest in several trees at very different heights in these trees. It is lined with roots and has many fruit capsules of the Poha, dry and more or less skeletonized, woven in the outside." From the meagre data that has thus far been gathered we conclude that April and May are the months in which *C. virens* usually breeds.

The eggs before me are much paler in color than those shown by Professor Newton (P. Z. S., 1897, p. 893, pl. li). Those figured

by Rothschild (Avifauna of Laysan) are very satisfactory figures of the eggs here described. The nest there shown lacks character.



NEST AND EGGS OF HAWAII AMAKIHI, CHLORODREPANIS VIRENS (GMEL.).

Wilson's figures (Aves Hawaiienses) of the nests and eggs are both misleading. The nest there figured is too loose and dilapidated, while the eggs are paler and freer of freckles than are those in the Museum collection.

Notes on the American Birds Collected in the Hawaiian Islands by Mr. Gerrit Wilder.

BY WM. ALANSON BRYAN.

THE Bishop Museum has received as a gift from Mr. Gerrit Wilder, of Honolulu, a collection of twenty-two birds which are, for the most part, of as much interest to ornithologists on the mainland as to persons residing in the Hawaiian Islands. Since California, the nearest point on the American continent, is some two thousand miles distant, the occasional occurrence in this group of a strange bird from that quarter is regarded as a circumstance worthy of permanent record.

The following list, which notes for the first time the occurrence of two North American birds in the islands, is given more especially in confirmation of recently published records. In a few instances the list simply emphasizes the fact that certain shore and water birds are to be met with in the Islands more commonly than is generally supposed. From the view of a sportsman, Mr. Wilder has, for a number of years, taken a lively interest in our game birds. He has seldom failed to preserve skins of such rare birds as came to his bag. In consequence our knowledge of the Hawaiian avifauna has been very considerably extended, as the following, no less than previously published notes[1] based on his field observations, testify.

Micranous hawaiiensis (Roths.). **Hawaiian Tern. Noio.**

The specimen (B. P. B. Mus. No. 2230) furnishes the first properly authenticated record of this Tern being taken on Maui, although it has long been known to frequent the waters about the entire group. The bird is typical *M. hawaiiensis*, differing, as I have elsewhere[2] pointed out, from *M. marcusi* and specimens in the Museum from the leeward islands of the group.

Phaëthon lepturus Lacép. & Daun. **White-tailed Tropic Bird. Koae.**

A single specimen from Maui.

[1] See Bryan's Key to the Birds of the Hawaiian Group, Memoirs B. P. Bishop Museum vol. i, no. 3.
[2] Monograph of Marcus Island, Occ. Pa. B. P. Bishop Museum, vol. ii, no. 1, p. 101.

Nettion carolinensis (Gmel.). **Green-winged Teal.**

The single specimen secured on Laysan Island by Dr. Schauinsland and referred to *Nettion crecca*, is, so far as I am aware, the only previous record of this species in the entire Hawaiian group. It is not improbable, however, that this teal will be met with on all of the islands sooner or later, in company with other foreign migratory ducks. The specimen (B. P. B. Mus. No. 2221) was secured by Mr. Wilder at Kahului, Maui, on January 20, 1892. The skin is that of an old male, having the white bars on the side of the breast and the inner webs of the scapulars vermiculated, thus making it typical *N. carolinensis*. Length about 14.50, wing 6.90, tail 3.15, tarsus 1.15, toe and claw 1.50, culmen 1.45.

The specimen secured on Laysan Island was a female bird, and as it is next to impossible to separate the females of the two species mentioned, and since *N. crecca* had never been reported from the Pacific coast of America, I suspect Dr. Schauinsland's determination for the bird now in the Bremen Museum to be in error, and that the male bird here recorded is in fact only the second example of *N. carolinensis* to be taken in the group.

Spatula clypeata (Linn.). **Shoveller.**

The Shoveller has long been a regular, though by no means abundant, visitor here, where it is to be found in company with the Pintail. Both species are found frequenting lagoons and marsh lakes pretty generally throughout the group. The male specimen (B. P. B. Mus. No. 2222), secured at Kahului, Maui, Jan. 24, 1894, measures: Length about 21.00, wing 9.90, tarsus 1.50, toe and claw 2.10, culmen 2.65.

Dafila acuta (Linn.). **Pintail. Koloa Mapu.**

A single mounted bird from Maui.

Anas wyvilliana Scl. **Hawaiian Duck. Koloa Maoli.**

The four specimens, a male, a female and two young in the down, have been mounted in a group. The downy young are dark brown with an olive cast to the plumage over the back of the head, neck and body. The under parts are a very light brown, becoming a pale buff on the abdomen and throat. Sides of the

head and a stripe over the eye buffy; a dark brown stripe extending through the eye; a dark spot on the ear coverts; a patch on the side of the rump, the scapularies and wings almost white. The smaller of the specimens is without the whitish patches on the scapularies and sides of the rump, while the dark line extending through the eye is paralleled by a similar one on the cheek extending back to the ear where they unite.

Plegadis guarauna (Linn.). **White-faced Glossy Ibis.**

A most interesting acquisition is a mounted specimen (B. P. B. Mus. No. 2218) of this Ibis, which is the third example to be taken in the group. There is no longer uncertainty about its occasional occurrence here. The status of the species, so far as I can learn, is based on, first, the specimen, from a flock of five, shot by Dr. W. T. Brigham on Molokai in the fall of 1865. It was sent to Professor Baird for determination and was eventually lost track of; second, the immature bird collected by Mr. Knudsen on Kauai in 1872; third, the present specimen, shot by Mr. Wilder at Kihei, Maui, in the winter of 1893.

The day previous to its capture Captain Christiansen, then master of the brig J. D. Spreckels, while off the coast of Molokai, saw a pair of these birds and shot one of them, securing the specimen. He kept the legs and wing and they were compared with the bird in Mr. Wilder's possession; from the light color of the feathers and legs they concluded this was probably the female and the mate of the specimen before me.

The bird is an adult in the winter plumage, i. e., with the entire head and neck streaked with black and whitish. Length about 22.50, wing 10.00, tail 3.50, tarsus 3.20, culmen 4.45.

Nycticorax nycticorax nævius (Bodd.). **Black-crowned Night Heron.**

A specimen of the young and the adult are in the collection from Maui.

Gallinula sandvicensis Streets. **Hawaiian Gallinule. Alae.**

One mounted specimen from Maui.

Fulica alai Peale. **Hawaiian Coot. Alae Keokeo.**

One specimen from Maui.

Actodromas maculata (Vieill.). **Pectoral Sandpiper.**

Professor Henshaw has already noted the occurrence of this species from the island of Hawaii. The specimen in the Wilder collection was taken at Waikiki, Oahu, January 1, 1892, and is unmistakably *A. maculata*, having only the shaft of the outer quill white and the culmen longer than the tarsus. The specimen in winter dress measures: Length 9.50, wing 5.25, tail 2.10, tarsus 1.10, culmen 1.15.

Calidris arenaria (Linn.). **Sanderling. Hunakai.**

Specimen from Kahului, Maui.

Heteractitis incanus (Gmel.). **Wandering Tattler. Ulili.**

One specimen from Maui.

Charadrius dominicus fulvus (Gmel.). **Pacific Golden Plover. Kolea.**

One specimen, Maui.

Oxyechus vocifera (Linn.). **Killdeer.**

Mr. Wilder has preserved a very good skin of this bird in winter dress which he shot on Maui. This is the first record of the Killdeer being taken in the Islands, although it is liable to be secured any season. If a colony could be established here it would be a valuable addition to our too meager list of shore birds.

Gallinago delicata (Ord). **Wilson's Snipe.**

The specimen before me is the second example of this well known game bird that it has been my privilege to examine within a year. The taking of a specimen on Laysan, the record of one taken on Hawaii, as well as the one noted by me from Oahu, together with the present specimen from Maui, would seem to fix this Snipe firmly in our list of island visitors.

A Bird's Nest of Pele's Hair.

WM. ALANSON BRYAN.

The nest here shown (Figs. 1 and 2) was deposited in the Museum by Mr. F. J. Lyman, and may be regarded as an exceedingly interesting example of the ease with which birds adapt themselves to their environment. The material used in its construction is of volcanic origin, being formed from drops of molten lava which are thrown into the air when the volcano Kilauea is in active eruption. As the drops rise they leave behind them fine glass-like

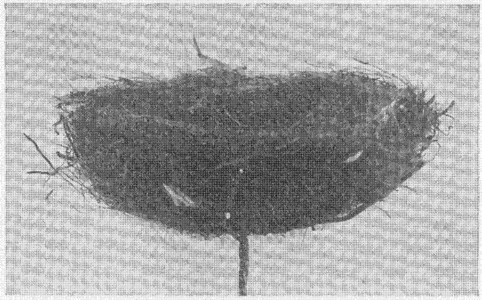


FIG. 1. NEST OF PELE'S HAIR: SIDE.

fibres which, when cooled, are broken up and carried away by the wind. The name "Pele's hair" is commonly applied to this product since the Hawaiian goddess Pele is supposed to preside over volcanoes, and the vitreous fibres are not unlike fine strands of hair.

The specimen, which is regarded as a family treasure, was secured on the island of Hawaii about five miles south of the crater of Kilauea, in November, 1881, while Mr. Lyman and his father were making a "short cut" journey from Kapapala Ranch to Olaa. Stopping for lunch almost in the centre of this barren plain, which in this region is covered with a-a and pahoehoe (lava), Mr. Lyman says: "I began to amuse myself by gathering bits of Pele's

hair, which was to be found there, intending to fill the pasteboard lunch box we carried with it. Noticing a small bird flutter into a bunch of a-a [rough lava] I went to the place. The bird flew out again, but I saw the nest wedged into a crevice in the rock. After considerable difficulty I broke away the rock and secured the nest. There were a few bits of egg shells in it. The bird was small and brown, not as big as a sparrow. There were only a few low bushes scattered about here and there over the plain."

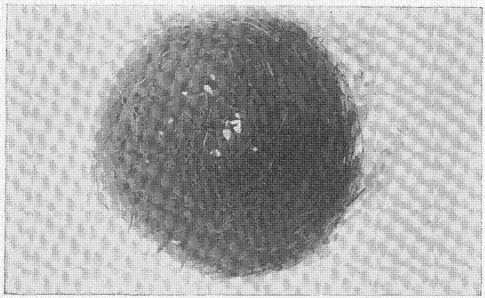


FIG. 2. NEST OF PELE'S HAIR: TOP.

The nest is, for the most part, constructed of the hair-like material, although there is a judicious use of fine roots, especially in the outer layers. Though slightly flattened with age, it is unmistakably nest shape, and could not be mistaken as a chance accumulation of the above materials blown into a crevice in the rocks. It measures 4.5 inches across by 1.75 in depth. The species of bird that is responsible for the nest will probably never be determined. I have elsewhere noted (Condor, vol. v, p. 79) that all of the common Hawaiian birds are to be found in the crater of Kilauea proper, but none of these, so far as I know, have been known to use this peculiar and local substance in nest-building; and none of the smaller Hawaiian birds have before been recorded as using crevices in the rocks for nesting purposes.

Two Undescribed Nests and an Egg of a Hawaiian Bird.

BY WM. ALANSON BRYAN.

I HAVE had some hesitancy in publishing the half-tone cut here given, for though unmistakably nests of Hawaiian birds, their specific identification cannot as yet be definitely made. However, since both the nests and the egg seem never to have been described (at least from specimens actually in hand) I append a brief account of them, believing that the uncertain features in connection with them will be eventually cleared up by farther field work.

3009 3010

NESTS AND EGG OF LOXIOIDES BAILLEUI OUST.

The nest on the branch (B. P. B. Mus. No. 3009) was secured by the writer in October, 1902, while driving through the Kona district of Hawaii. It was built in a Mamani tree (*Sophora chrysophylla*) growing close beside the road at an elevation of about 1000 feet. The nest was about eight feet from the ground, and was evidently a year or more old. It was substantially built of grass and weed stems, with a few chance bits of lichens added in the lining. It measures a trifle over 4.00 in. across by 2.50 in. in depth; is bowl-shaped, and taken all in all is well preserved.

The second nest (B. P. B. Mus. No. 3010) was secured from Mr. C. E. Blacow, who found it placed about seven feet from the

ground in a dead Mamani tree on Horner's Ranch, Hamakua, at about 7300 feet elevation. The tree in which the nest was built was standing in an open space surrounded by live Mamani, the whole clump being sheltered from the winds by a ridge close by. This nest, when compared with the one just described, is like it in form, size and materials, except that a lining of horse hair (a material not available for the Kona nest) has been added in the Hamakua nest in place of lichens. When found, in October, 1903, this nest, which was then apparently deserted, contained one rotten egg that measures $.93 \times .67$ in. It is a creamy white color with pale lilac under markings. Over the surface brown blotches and freckles are distributed, but they are somewhat crowded together about the large end.

Mr. Blacow, who has collected extensively in the district and is well acquainted with the birds of the island, was fairly convinced that the egg is that of the Palila (*Loxioides bailleui* Oust.), since it was not only a fairly common bird in the locality, but one found usually frequenting the Mamani. At the time the nest was collected, in addition to securing the globular nests and white eggs of the introduced *Carpodacus mexicanus obscurus*, he saw *C. virens*, *O. mana*, *H. wilsoni* and *L. bailleui* in the bushes round about, but did not see *V. coccinea* or *H. sanguinea*.

Wilson (Aves Hawaiiensis), writing on the Palila, states that "On June 14 I found a nest from which I saw the bird fly; it was placed in the topmost branches of a Naio tree (*Myoporum santalinum*) [*sic*], about 35 feet from the ground, but contained no eggs, and when I subsequently revisited it we found it deserted. It may be briefly described as cup-shaped, 4 inches in diameter, and very loosely constructed of dry grass, among which are interwoven a considerable quantity of grey lichens, the inside being composed of the same lichen with a few slender rootlets added."

The two nests here shown differ from each other slightly in the material used in the lining. No. 3009 is very similar to the nest described by Wilson, except in the amount of lichens used. The egg here described is out of proportion to the size of any bird other than the Palila, which has been secured in the locality; hence, by exclusion I conclude that this is the first description of the egg of *Loxioides bailleui*.

Nest and Eggs of Heterorhynchus wilsoni Roths.

WM. ALANSON BRYAN.

OWING to the field labors of my friend Mr. C. E. Blacow I am able to give a photographic reproduction together with a description of the first nest and eggs of the genus *Heterorhynchus* to be recorded. Although originally erroneously identified by the collector, through circumstantial evidence, as *Loxioides bailleui*, he has since been able to clear up the identity to our satisfaction and

NEST AND EGG OF HETERORHYNCHUS WILSONI ROTHS.

writes me under date of May 4, 1905, that "I also found a Palila nest, and the female is on the nest. I will wait until the egg hatches and then send the nest and young to you. Those last two nests that I took to the Museum are *Heterorhynchus wilsoni* nests if the eggs are anything to go by. I found a nest the other day with the *H. wilsoni* standing on the edge of it. Today I visited the same nest and found one egg. The egg is the same as those in the other nests. So the Palila that I saw fly out of the tree that I found one of the other nests in was probably feeding and did not have any connection with the nest whatever."

The two nests referred to were secured by Mr. Blacow on June 27, 1904, at about 7500 feet elevation among the Mamani (*Sophora chrysophylla*) trees growing on Horner's Ranch, Hamakua, Hawaii. The larger of the two, the one here shown, was much fresher than the smaller one, being partly composed of leaves of the Mamani that were still green. Both nests were about nine feet from the ground and placed on the outside of the tree.

As the cut shows, the nest is a rather bulky affair, 5.00 inches in diameter by 2.50 inches deep; the cup is 1.75 inches across by 1.50 inches deep. The structure is substantially made, the body being built of the green leaf stems and leaves of the Mamani; to this is added a generous lining, an inch thick, of greenish-white lichens, such as are common in the Hawaiian forests at higher altitudes. The single egg, which unfortunately is slightly damaged, is a pointed oval in form, measuring .75×.56 in.; the ground color is a rich cream; about the larger end the shell is wreathed with confluent spots of pale lilac which forms the under color; over the whole surface, but especially over the larger end, are sprinkled fine brownish freckles.

The second nest was similar in structure to the one figured, but differed in being somewhat smaller. The eggs measured .76×.53 in. and .75×.54 in., and were marked similarly to the ones before me.

All the collectors who have worked on Hawaii have found the Akiapolaau frequenting the Mamani, and have remarked on its curious woodpecker-like habits. It was therefore to be expected that the nest when found would be placed in the Mamani thickets. Since both the bird and the egg of the Palila are much larger than the Akiapolaau, or its eggs here described, there seems every reason to accept the foregoing as a correct description of the nest and eggs of this interesting species, the habits of which have heretofore been so little known.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—No. 4.

Director's Report for 1905.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1906.

REPORT.

YOUNG as this Museum is, and large as its housing appears, the collections are already in a congested condition. This is not the case with the Hawaiian portion, for Hawaiian Hall was planned to accommodate all that was likely to be exhibited of the productions of this group, and the room is ample, but the crowded state is very evident when we consider the collections from the other parts of the Pacific which are so important in helping to an understanding of the relation and origin of Hawaiian works.

We have at present all the ''outland'' things in Polynesian Hall, whether they be Polynesian, Papuan, or of mixed origin. From the beginning it has been our hope to separate these collections, of so different origin and character, from the true Polynesian products, and the past year the Director has given much time to the preparation of plans by which the desired end may be attained. By removing the very crowded Papuan, Australian, Fijian and Micronesian collections from Polynesian to a proposed Papuan Hall the desired relief could be obtained and space left in Polynesian Hall for a full sized carved Maori house, food house and chief's tomb, and also a carved war canoe of the type so beautifully shown in the Auckland Museum. The Tahitian and Marquesan specimens which are in sight, although not yet in possession, will fill the vacated cases, and the specimens from New Guinea, New Hebrides, the Solomons, and the Bismarck Archipelago will be better arranged and exhibited in a larger hall. Both the New Guinea and the Micronesian collections suffer greatly by lack of case room.

When this can be accomplished, the limit of exhibition room will have been reached, so far as ethnology is concerned, for the

space then provided will admit of a proper exposition of the life of the various groups ancient and modern, for the ordinary visitor, and the material beyond this should be preserved for the student of ethnology in a way that it can be studied without deranging the exhibition series.

This preservation of material is of far greater importance here than in most museums. Even in the case of most perfect construction exposure to the strongly actinic light of these clear Hawaiian skies is the necessary concomitant of public exhibition, and from the experience of the fifteen years in which certain specimens have here been on exhibition only two days in each week, being carefully covered the rest of the time, it seems certain that thirty years will be the limit of color life in kapa, feathers and shells. When we add to this danger the attacks of a host of never tiring insects, need is great of unusual precautions if the second generation from the present is to see the choice kapa, feather cloaks and the native birds, most of which will be extinct outside of museums. I have devised a store case of steel which seems to meet all the requirements except as to cost, and I am at present trying to arrange cheaper but equally effective construction of these receptacles, of which the Museum needs a large number.

Of course as this is a working museum, additional laboratory room is greatly needed. The wooden buildings at some distance from the Museum, that have for some years served the purpose, were intended for makeshifts, were flimsily constructed, and are rapidly falling into decay. They should at once be replaced, and the question is whether by another temporary structure or by such a building as will serve the present and future needs of the Museum work, be permanent and fireproof, fit in architecturally with the present Museum, and while offering all needed laboratory facilities, be also a proper storeroom for collections not on exhibition.

We have not at present any room that we can offer to a visiting naturalist who desires to critically examine any of our collections, without turning out from his table some working member of

the staff. Our library is more and more consulted by lawyers for our newspaper files, customs officials for records of analyses, etc., and naturalists. Small as our library is, it still is of rare quality as a working library, and it should be more conveniently housed and largely increased in certain lines; it is impossible to keep up with our needs on a few hundred dollars a year. The list given below of the accessions to the library during the year by exchange of our publications will show how rapidly our shelves are being filled from that source.

With these additions to the Museum, of which the plans have been submitted to the Trustees, the original scheme of a museum as conceived by the Director many years ago will have been carried out, and a very complete apparatus provided for the purposes for which this Museum was founded. Today we could not wisely accept any large collection because we have not even room to store it. Certain matters of value are even now stored in wooden buildings in the school yard where they are liable to destruction from fire as well as from other causes.

During the past year the work done at this Museum has not been of the kind that a Director might point to with pride as a marked step in advance, but none the less it has been constant, careful and honest work that tells in the condition of the Museum. I believe that every member of the staff has worked with hearty interest and to the utmost opportunity. We should have been glad to point to large collections added to our stores; to many more excellent casts of our less known fruits added to our little orchard in Hawaiian Hall; to many score of Mr. Thompson's remarkable fish casts; to some important publication during the year. None of these good things were destined to come within our good fortune. We have simply grown, mostly by natural accretion. We have, however, tried to do the best with the means at our disposal.

In the department of Ethnology we have had comparatively few accessions, but we have had an opportunity of studying a collection of Hawaiian objects of great interest which were found

walled up in a branch of a cave on Hawaii. These are so interesting that I have thought best to fully describe them in an appendix to this report, especially as they are at present in private hands and of course liable to injury or destruction by fire. It is greatly to be hoped that this, the most interesting find hitherto recorded, may eventually come into the possession of this Museum.

In the department of Ichthyology the collection of wet specimens has been carefully examined and the portion from the southeast Pacific been compared with the catalogue and placed in jars. The description of such of these as are new has been prepared by Mr. Seale, formerly collector for this Museum, and his manuscript has been carefully revised by Dr. David Starr Jordan, and arranged by Mr. W. A. Bryan and is now in type. The fine collection of painted casts has been identified and labelled. Among these casts were found several new species which have been described by Mr. Bryan, and the descriptions and figures are appended to this report. Comparison with the series of colored plates in the new report of the United States Fish Commission on the Hawaiian Fishes, shows that we have nearly all the fish there represented in our series of casts.

In the department of Ornithology the Henshaw collection has been catalogued and placed in suitable boxes. A group of Hawaiian shore birds has been placed on exhibition, and another large group of birds has been partly prepared. The collection of nests and eggs, already a large one, has been somewhat increased.

In the department of Conchology the Garrett collection has been partly relabelled in accordance with Dr. Dall's identification, and has also been rearranged to accord with the new system—a change involving great labor, as some ten thousand cards on which the shells are mounted had to be readjusted to the drawers. Dr. Cooke has continued his work on the land shells, and was given leave of absence during the latter half of the year to visit the depositaries of type specimens of our Pulmonata in America and abroad. He is still engaged in this very important work with gratifying success.

In the botanical department new interest in the Hawaiian Algæ has awakened by the publication of Professor W. A. Setchell's paper on Hawaiian "Limu," and by the purchase of Miss Tilden's collection of specimens.

The Museum Press has issued only the Annual Report. The Memoir on Mat and Basket Weaving has dragged through this the second year: portions of two other papers have been printed, and many hundred labels have filled the list of work. While the year has been a busy one for the printer, it is hoped that 1906 may see a larger number of publications issued. The delay has not been for want of material.

There have been no changes in the Museum Staff.

The attendance for the year is shown in the following table, and as in previous years it shows the variety of nationalities that frequents the Museum. The total number of visitors, 14,296, is greater than in previous years. Of the orientals the Chinese, while showing a far greater number in proportion to their population, fall below the Japanese in actual number of visitors. A very curious result of advertising is shown in the table. During my absence from the Islands, it was decided by the Trustees to advertise the Museum in the daily morning paper of Honolulu, and a very full schedule of times and seasons when the Museum might be visited was published for seven months. At once the number of visitors fell off to a marked extent, as may be seen on the table, and the telephone was more than ever used to inquire "when the Museum was open?" When the advertisement was dropped the increase was as marked as the decrease had been before.[1] It was a curious coincidence, but I do not attempt to explain it. The admission of passengers on through steamers that may be in port on days when the Museum is not open to the public, by written order from the office of the Trustees in town, has continued during the year. There have been more of these visitors on special permits, and the number is likely to increase with the increasing

[1] This is shown in the table for 1906.

number of steamers arriving, and there are several things in regard to these visitors that seem worth noticing. First, their average stay in the Museum is less than fifteen minutes; then they are almost exclusively American or European; they require more supervision than the mixed nationalities on public days; they have the disease that seems to attack many modern tourists all over the world (which compels them to annex plates, spoons or napkins on steamers or at hotels, or the section numbers in Pullmann cars), and as none of these souvenirs are to be found in the Museum, the specimens being carefully protected in cases, all exposed labels are taken as proof that they have been in the Museum; they rarely buy a guide book. This will show that at times there are in the Museum other curiosities than those belonging there. Less troublesome and more amusing are the parties that come with a leader who "knows it all" and therefore disdains a guide book. One such leader was lately heard telling his party that the fine specimen of a sperm whale in Hawaiian Hall was not a sperm whale at all (the Museum people ought to know better), it was a bottle-nose whale. Another informed his companions that the stones of which the adzes were formerly made were very rare, in fact had been exhausted; still another, that these same stones were all meteorites! It sometimes seems hardly worth while to label specimens.

TABLE OF ATTENDANCE.

1905.	Whites.	Hawaiians.	Portuguese.	Chinese.	Japanese.	Others.	Open on Public days.	Open on Other days.	Visitors on closed days.	Average Attendance. Public days.	Average Attendance. Other days.	Total Visitors.
January	436	190	53	150	321	20	9	4	13	129	3	1170
February	553	280	45	529	225	....	9	2	9	180	4	1632
March	468	269	119	291	489	31	9	3	37	181	12	1667
April	760	200	45	258	434	1	9	5	29	185	6	1698
May	394	210	31	203	283	29	9	10	40	123	4	1150
June	429	177	72	204	309	18	10	5	37	117	7	1209
July	798	115	39	147	191	9	10	6	79	122	13	1299
August	350	84	32	82	148	38	8	6	37	87	6	734
September	424	217	52	242	153	41	11	6	67	95	11	1129
October	484	202	71	184	117	21	9	5	45	115	9	1079
November	278	111	26	109	204	33	8	4	26	92	6	761
December	337	118	35	128	118	32	10	5	45	72	9	768
Totals	5711	2173	620	2527	2992	273	111	61	464	124.6	7.6	14,296

List of Accessions.

DEPARTMENT OF ETHNOLOGY.

Gifts.

6680 Shark tooth knife. Gilbert Ids. Given by Mr. F. G. Krauss.
6681 Shell beads of necklace. Molokai, H. I. Given by Mr. A. F. Judd.
6682 Bone, perforated. Molokai, H. I. Ibid.
6684 Poison aumakua. Hawaii. Given by Mrs. Luther Wilcox.
6685 Mask. New Guinea. Given by Mrs. E. L. Webb.
6698 Armor, coir trousers. Gilbert Ids. Given by Mrs. Andrews.
6699 Kupee niho ilio. Hawaiian Ids. Ibid.
6700-02 Three kapa. Hawaiian Ids. Ibid.

Purchased.

6888-90 Three kua kapa. Hawaiian Ids.
6891 Shrimp trap. Hawaiian Ids.
6892 Ring poi pounder. Hawaiian Ids.

Exchanged.

6686 Kite. New Zealand.

DEPARTMENT OF ORNITHOLOGY.

Given.

3153 Phasianus torquatus. Oahu. Given by Mr. J. W. Harvey.
2600, 3155-57, 3165-66 Four skins and two skeletons of Nestor notabilis. New Zealand. Given by Dr. W. T. Brigham.
3160-62 Two young owls and one egg. Given by Mr. A. F. Judd.
3164 Gymnorhina tibicen. Australia. Given by Dr. W. T. Brigham.
3151 White cockatoo. Given by Mr. S. W. Smith.
8716 669 specimens birdskins, eggs, etc. Laysan Id. Collected by Mr. Bryan.
8717 Bird's nest, Kona, Hawaii. Collected by Mr. Bryan.

MISCELLANEOUS.

L 95 Bird's nest of Pele's hair. Loaned by Mr. F. A. Lyman.
L 94 Tortoise shell box. Ibid.

6683 Deerskin, showing markings of goat. Given by Mr. A. F. Judd.

6687 Collection of fossils. Given by the Director of the Technical College, Newcastle, N. S. W.

8708 Picture of coconuts and bananas. Painted and given by Mrs. S. B. Dole.

8710 Quartz from Robinson reef. Johannesburg. Given by Mr. A. M. Richardson.

ADDITIONS TO THE LIBRARY.

Those acquired by exchange are denoted by an asterisk.

*Accademia dei Lince, Roma.—Memoires, Serie Quinta, vol. iv; vol. v, fasc. 1-7, 10.

*Academy of Natural Sciences of Philadelphia.—Proceedings, vol. lvi, pt. 3; vol. lvii, pts. 1, 2.—Journal, Second Series, vol. xiii, pts. 1, 2.

American Anthropological and Ethnological Societies.—Memoirs, vol. i, pts. 1, 2 and Supplement.

American Anthropologist.—Vol. vi, pt. 5; vol. vii, pts. 1-3.

*American Museum of Natural History.—Memoirs, vol. iii, pt. 3. —Bulletins, vol. xvii, pts. 3, 4; vol. xviii, pt. 3; vol. xx.—Annual Report of the President for 1904.—Journal, vol. v, pts. 1-4.

*American Philosophical Society.—Transactions, vol. xxi, pt. 1. —Proceedings, vol. xliii, nos. 178-80.

Anatomy and Physiology.—Journal, vol. xxxix, pts. 2-4; vol. xl, pt. 1.

*Anthropological Institute of Great Britain and Ireland.—Journal, vol. xxxiv, July–Dec., 1904; vol. xxxv, Jan.-June, 1905.

*Anthropologie de Paris, Revue de l'École d'.—Quinziéme Année.

*Anthropologie de Paris, Société d'.—Bulletins and Memoires, Tome Cinquiéme, fasc. 1-6; Tome Sixiéme, fasc. 1, 2.

*Asiatic Society of Bengal.—Proceedings, 1904, nos. 6-11.—Journal, lxviii, pt. 2, nos. 3-5; pt. 3, nos. 3, 4.—Journal and Proceedings, vol. 1, nos. 1-4.

*Australian Museum.—Records, vol. v, no. 5.—Report for the year 1903-4.

Banks, Sir John, and Solander, Dr. Daniel.—Botany of Cook's First Voyage. Part 3. London, 1905.

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Borlase, Wm. C.—The Dolmens of Ireland, 3 vols. London, 1897.

*Boston Public Library.—Annual List of New and Important Books.—Monthly Bulletins.

*Boston Society of Natural History.—Proceedings, vol. xxxi, pts. 2-10; vol. xxxii, pts. 1, 2.—Memoirs, vol. v, nos. 10, 11; vol. vi, no. 1.

Brinton, Daniel G.—Aboriginal American Authors and their Productions. Philadelphia, 1883.

British Museum.—Catalogue of the Collection of Birds' Eggs in the Museum, vol. iv. London, 1905.

*Brooklyn Institute of Arts and Sciences, Museum of the.—Science Bulletin, vol. i, nos. 5, 6.—Cold Spring Harbor Monographs, iii-v.—Report of the Museum for 1904.

*Bureau of American Ethnology.—Bulletins 28, 29.—Annual Report for 1901-2.

Bureau of Statistics, Department of Commerce and Labor.—Statistical Abstract of the United States.—Commerce and Navigation of the United States, 2 vols. Washington, 1904.

*California Academy of Sciences.—Proceedings, Zoology, vol. iv, nos. 1-3.—Memoirs, vol. v, no. 1.—Occasional Papers, no. 9.—Memoir of William Alvord. Memoir of Dr. Harvey Wilson Harkness. Account of the Life and Services of Dr. Hans Herman Behr.

Cambridge Natural History.—Fishes and Ascidians. London, 1904.

*Carnegie Museum.—Memoirs, vol. ii, nos. 2-5.—Annals, vol. iii, nos. 1-3.

*Carnegie Institute of Washington.—Publications, nos. 4, 6, 7, 9, 10-31, 35-37, 41.—Year Books, 1-3, 1902-04.—Founder's Day, 1904.—Contributions from the Solar Observatory, Mt. Wilson, California, nos. 1, 2.

Census, Twelfth, of the United States, taken in 1900.—Statistical Atlas. Washington, 1903.

Chief Justice of the Supreme Court of Hawaii.—Report for 1903-4.

Cincinnati Museum Association. Twenty-fourth Annual Report, 1904.

Code Commision, Hawaii.—Report. Honolulu, 1905.

Commissioner of Labor.—Nineteenth Annual Report, 1904.—Wages and Hours of Labor. Washington, 1905.

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Carnegie Museum. Pittsburg, Penn.
Colonial Museum. Wellington, N. Z.
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Free Museum of Science and Art. Philadelphia.
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Royal Society of Queensland. Brisbane.
Royal Society of South Australia. Adelaide.
Royal Society of Victoria. Melbourne.
Smithsonian Institution. Washington.
" " Bureau of American Ethnology. Washington.
" " U. S. National Museum. Washington.
Società Italiana di Antropologia e Etnologia. Firenze.
Société d'Anthropologie. Paris.
Société Royale des Antiquaires du Nord. Copenhague.
Société Royale Malacologique de Belgique. Bruxelles.
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South Australian Museum. Adelaide.
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University of Kansas. Lawrence, Kansas.
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U. S. Experiment Station. Honolulu.
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Wagner Free Institute of Science. Philadelphia.
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[OLD HAWAIIAN CARVINGS.—A short article was written on this subject describing certain very interesting objects found in a walled-up cave on the western side of Hawaii; this was included in this report as presented to the Trustees early in the year, but when a fuller consideration was given to the illustrations it was thought best to enlarge the page, and the article was transferred to the quarto Memoirs, of which it forms Vol. II, No. 2, and has lately been issued.]

Nest of the Hawaiian Hawk.

WM. ALANSON BRYAN.

THE first nest of the Hawaiian Hawk (*Buteo solitarius* Peale) that has come under my personal observation is the one here figured and described. It was given to the Museum by Mr. C. M. Walton,

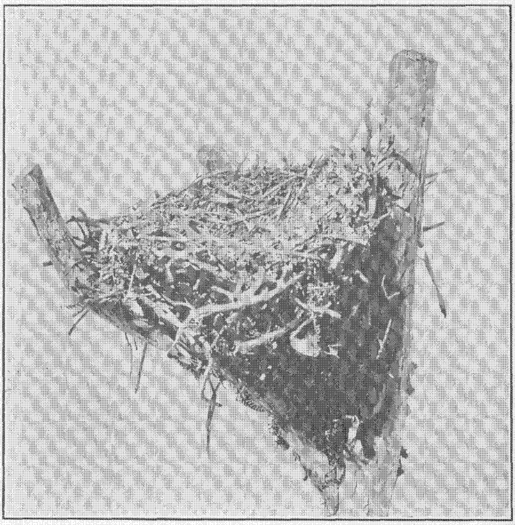


FIG. 1.

Manager of the Hawaiian Agricultural Co., at Pahala, Hawaii. With it he supplied the information that the nest had been collected from a tall ohia tree, growing in the woods some distance from his residence, a few hours previous to our arrival at his home on October 24, 1902. The nest had been located a fortnight or more before it was secured, at which time two young hawks, just assuming the first plumage, were taken from it. The young hawks

were sent to Hilo to be mounted. Through the purchase of the Henshaw collection one has been added to the Museum series.

This specimen does not differ materially from the nests made by birds belonging to the same genus which is common on the American continent. It is composed of sticks a little more than a quarter of an inch thick and twelve inches in length, which appear to have been gathered from the ground. These are all loosely piled in the upright fork without an attempt at giving the structure form until the bowl of the nest is reached, when they take on a more systematic arrangement to conform to the shape required for a nest. Into this pile of sticks the Io has introduced the stems and fronds of ferns, and of them it has made a loose floor or lining for the nest. The structure measured over 18 inches from out to out across the top, was 15 inches high, with the hollow depression some three inches in depth (Fig. 1). No trace of egg shells could be found about the nest, hence the color and form of the eggs remain unknown. Mr. Walton showed me a second nest that was much weather-beaten and evidently a year or two old, which did not differ in structure, shape or location from the one described above.

The nest is of great interest from the fact that it puts the nesting season of the Io in the early autumn months, whereas its cousins on the continent mate and nest in February and March. It will be interesting to ascertain whether or not this species nests in the autumn only, or rears two broods a year, or has no set season for mating. The specimen makes a valuable addition to our growing series of Hawaiian nests.

Egg of the Hawaiian Goose.

WM. ALANSON BRYAN.

THE Bishop Museum is indebted to my friend Mr. C. M. Walton, Manager of the Hawaiian Agricultural Company, Kau, Hawaii, for the eggs of the Hawaiian Goose, *Nesochen sandvicensis* (Vig.), which forms a part of the group of this species now on exhibition in Hawaiian Hall.

The Nene, as this goose is called by the Hawaiians, has been kept in confinement repeatedly in these Islands, while on several occasions specimens have been taken as far as London, where they

lived for a time in the Zoological Gardens. However, I am unable to find any previously published descriptions of the eggs.

I understand that the nest in structure, size and material does not differ to any extent from those of other geese, while usually two or three, though rarely five, eggs are laid. These are oval in form, of good firm texture, pure white in color, with a smooth, even surface, and measure 3.30×2.45 inches. Although occasionally eggs are laid by domesticated birds they are rarely ever fertile; while eggs taken from nests found in the mountains, where the Nene rear their young in the wild state, hatch when placed under domestic fowls.

Three New Hawaiian Fishes.

WM. ALANSON BRYAN.

WHILE looking through the collection of fish casts on exhibition in this Museum recently, Dr. David Starr Jordan expressed a belief that certain species shown were undescribed. Descriptions of the supposed new forms were accordingly prepared and submitted to him for verification, with the result that three species here published as new seem to be valid.

The descriptions and figures of four recently described species are also appended, chiefly for the color notes. They are either wanting in former characterizations or are so much at variance with those of our casts, which are colored with great care from life, as to make the notes here given worthy of record.

FAMILY ZANCLIDÆ.

Zanclus ruthiæ, new species.

Head 2.1 in body; depth of body a little greater than length; eye 2 in snout; D. VII, 38; A. III, 33; snout 1.75 in head.

Body, oblong, much compressed and elevated, covered with minute rough scales; mouth, small, with brush-like projecting teeth; no teeth on the palate; snout short, bones of the top of the head thick and solid; upper profile of the snout very concave (in type no indication of a frontal horn); preopercle unarmed; gill membranes broadly united to the isthmus; a single continuous dorsal with seven spines, the third and succeeding spines produced

into long filaments; 1.3 times length of body; anal similar to soft dorsal with the anterior rays somewhat produced, about one-third length of body; caudal peduncle unarmed; caudal fin lunate; pectorals short; ventrals pointed; posterior dorsal rays short, vertical or even inclined forward; pectorals longer than the snout; ventrals filamentous, half length of body; a short recurved spine on the side of the snout above the angle of the mouth.

Color in formalin × alcohol. General color, silvery gray; an obscure, dark, subcutaneous band the width of the eye extends over the interorbital region; upper and lower lip blackish; distal end of caudal peduncle blackish when held to the light; caudal terminating in a pale crescent-shaped band.

Color (based on plaster cast colored from life). Body, silvery, with a greenish sheen; a green splash above the eye; lips blackish; caudal peduncle greenish and olive; elongated dorsal rays black, remaining rays smoky, with the edge of the fin yellow; anal smoky brown, with a narrow yellow edge on its posterior margin; ventrals smoky brown, varied with an olive wash; pectorals colorless; caudal smoky brown, like the anal, and terminating in a lunate band of yellow.

The fish from which the cast was colored was secured in the Honolulu market, October 4, 1903, and measures 2.75 inches in length. Type B. P. Bishop Museum No. 3359. (Fig. 2.)

This species seems to be a *Zanclus*, and does not differ much in form from young examples of *Zanclus canescens*. But the coloration is wholly different, and the species must be distinct from the ordinary "Moorish Idol".

Pseudoscarus heliotropinus, new species.

Head 3.2 in body; depth 3.1; eye 8 in head; interorbital 2.6; D. IX, 9; A. II, 9; P. 14; scales 2-25-7.

Body very stout; head deeper than long; snout blunt, the dorsal outline strongly convex, the anterior profile rising almost vertically from the lips; teeth blue; upper jaw with one or two blunt canines; depth of caudal peduncle 2 in head; scales deeper than long; two rows of large scales on the cheek, one row on the sub-opercle; lateral line interrupted under the last dorsal ray, but continued on the second row below; pores with two or three irregular branches; anal and dorsal about equal in height; caudal deeply

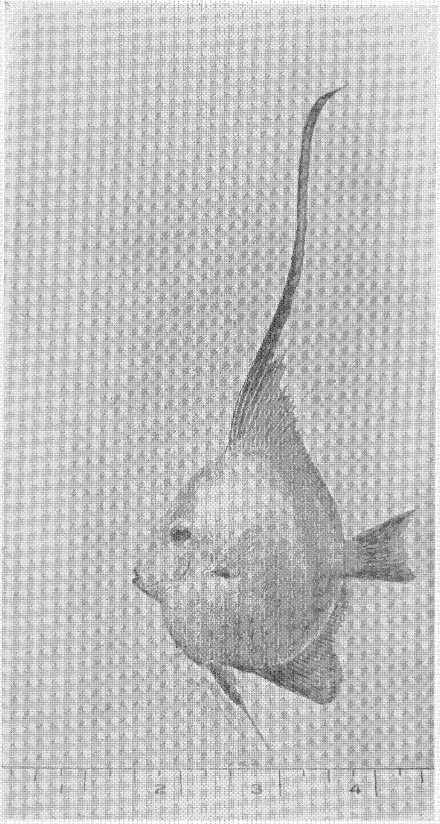


FIG. 2.—*Zanclus ruthiæ* Bryan.

lunate, the outer rays extending beyond centre rays twice the length of latter; ventral 1.8 in head, falling short of anal by .6 their length; pectoral broad, 1.2 in head.

Color in formalin × alcohol. General color, grayish brown; brownish over the snout; an indistinct greenish patch on the cheek and lower lip; ventral margined and tipped with greenish, remaining portion pale; dorsal with a greenish base and margin; caudal like the body, but with outer streamers and two or three ill-defined spots greenish; base and outer third of the anal greenish, portion between pale; pectoral pale, with an indication of green. Teeth blue.

Color (based on plaster cast colored from life). General color of lower half of body, pale salmon, varied with bluish scale markings; dorsal anterior half of body back to tip of pectoral heliotrope brown; remainder of dorsal portion as well as caudal peduncle pure green, varied with pinkish scale markings; interorbital region greenish brown; upper lip green, edged with orange-ochraceous; an ill-defined brown stripe over the middle of the snout; a broad orange-ochraceous patch on the lower lip which is bordered above and below with blue, the latter color joining at the angle of the mouth, becoming a greenish blue patch on the cheek which is crescent-shaped on its posterior outline, one point of the crescent reaching to the eye; greenish stripes radiating from the eye, narrow greenish stripe connecting the points of the crescent on the cheek; scales on the cheek greenish; chin flesh-color, with a few irregular blue spots; dorsal edged with blue; blue marks along the bases of the third to sixth spine; remaining rays with serrate green ray marks; remainder of the fin salmon color; anal broadly margined with blue; blue membrane spots at base, forming an irregular line; remaining portion salmon-pink; caudal with the outer rays blue passing into green, the green extending over most of the elongated rays; inner edge of the elongated rays and central portion of the tail ochraceous-salmon; four large irregular green blotches on the middle rays arranged so as to form a sub-terminal bar, with its posterior edge one-fourth of the length of the middle rays from the margin of the caudal; a few blue spots between the blotches and the base of caudal; ventrals salmon color, the outer ray for its entire length, the second for its distal half blue; pectoral green; iris yellow.

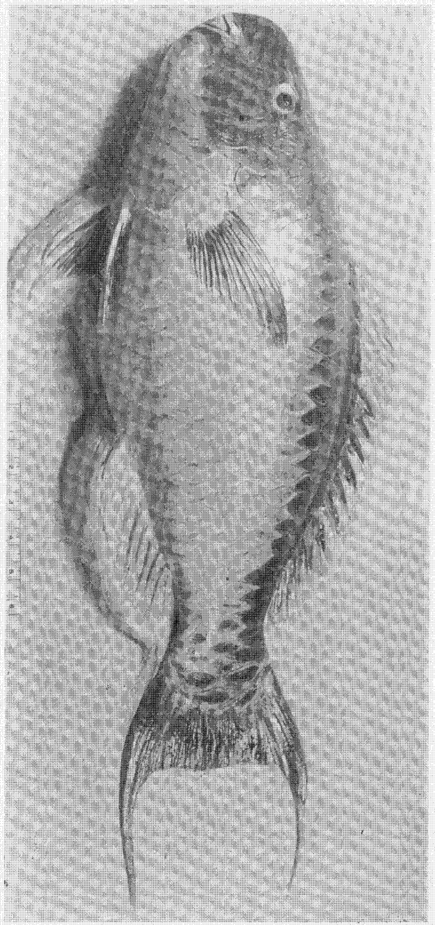


FIG. 3.—Pseudoscarus heliotropinus Bryan.

The type (B. P. B. Museum No. 3363) here described was secured in Honolulu market, February 8, 1903, and measures 22 inches. (Fig. 3.)

Pseudoscarus vitriolinus, new species.

Head 2 in body; depth 2; eye 8 in head; snout 2.1; preorbital 4; interorbital 2.6; D. IX, 7; A. II, 8; P. 1.33; V. 2; C. 2.1; scales 1½-25-6.

Teeth deep blue-green; caudal slightly rounded; body robust; cheeks with two rows of five and six scales respectively; lower limb of opercle with six scales; two very small pointed canines at the angle of the mouth; about half of the upper and lower dental plate covered by the lips; front profile blunt.

Color in formalin × alcohol. General color, dirty grayish white; all the fins more or less greenish; a pale flesh-colored line along the middle of the dorsal and at the base of the anal; upper and lower lip, side of head, and radiating stripes from the eye greenish.

Color (based on plaster cast colored from life). Dorsal anterior half of the body, greenish, passing to greenish yellow, becoming yellow back of the tip of the pectoral, this color extending to the caudal peduncle; caudal peduncle green, with pinkish scale markings; abdomen and sides of body pinkish, varied with green and blue scale markings; two parallel blue lines the diameter of the eye in width, extending from a little posterior of the base of the pectoral to even with the anterior base of anal; a green line along the belly from base of ventrals to anal; top of head bluish green; edge of upper and lower lips pink; base of upper and lower lip joined to an ill-defined patch reaching to and extending below the eye, green; a narrow band along the snout to the eye pale pink; pink and green stripes radiating from the eye; iris yellow and red; dorsal blue, with a dull salmon-red stripe along the basal third, beginning at the base of the first dorsal spine and extending back the length of fin; on the posterior half of dorsal the salmon-colored stripe extends up the fin rays a short distance; on the last five rays these projections join to inclose irregular green membrane spots; pectoral bluish green; basally marked with pink; several irregular pink spots scattered over the fin; ventral greenish blue; anal with a wavy stripe of pink at the base, which extends the whole length

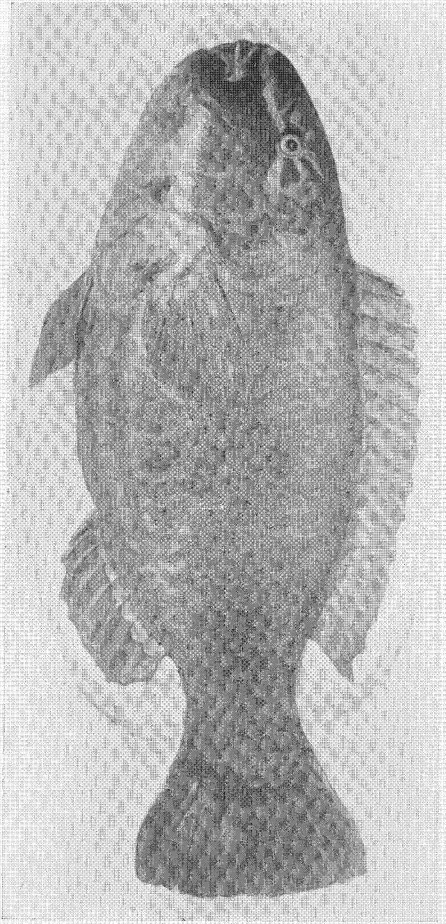


FIG. 4.—*Pseudoscarus vitriolinus* Bryan.

of the fin, excepting the first spine and last ray; remainder of anal greenish blue; caudal blue.

The type (B. P. B. Museum No. 3364) here described was secured in the Honolulu market September 26, 1902, and measures 15 inches in length. (Fig. 4.)

Callyodon lauia Jordan & Gilbert.

Head 2 in body; depth 2; eye 6 in head; interorbital 3.1; preorbital 5; D. IX, 10; A. II, 9; P. I, 6; V. 2; C. 1.5; scales 1½-24-6.

Dorsal and ventral outline alike; head pointed; jaws without canines; 2½ rows of scales on the cheeks, the third row of two scales; caudal with the outer rays .60 longer than the central ones; teeth white; eye one diameter below the upper profile of head; nostrils very small; 4 scales on median line of back before the dorsal; tip of pectorals even with tip of ventrals; origin of ventrals under posterior base of pectoral; base of pectorals even with tip of opercle; dorsal and anal similar in form; lateral line interrupted under the end of soft dorsal, 16 scales being pierced before the interruption.

Color in formalin × alcohol. General color, dead horn brown; the margin and base of both dorsal and anal slightly washed with green; the central portion of the anal with a distinct median stripe (.10 in. broad) of pale flesh color; caudal slightly olive-green at the base and tip; the outer rays and median band (.25 in. broad) pale flesh color; band margined on both edges with darker color.

Color (based on plaster cast colored from life). General color of body, deep rich red over the back, becoming orange-red and saturn on the head, passing to dull yellow on the ventral portion; a narrow blue line extending through the eye; edge of upper and lower lip green; the green lines of lips join at the angle of the mouth and extend back on the cheek to a point below the posterior margin of the eye; a narrow blue line at the base of the lower lip; an irregular shaped blue patch on the lower chin; ventrals yellow, edged and tipped with blue-green; outer half of dorsal abruptly green; a narrow orange line of demarkation extending, with slight interruptions, the length of the fin; below and joined to the orange line the fin rays are orange-yellow, forming a series of greenish-blue spots on the intervening membrane; pectoral red, paler than the body, slightly margined above and below with blue; anal with

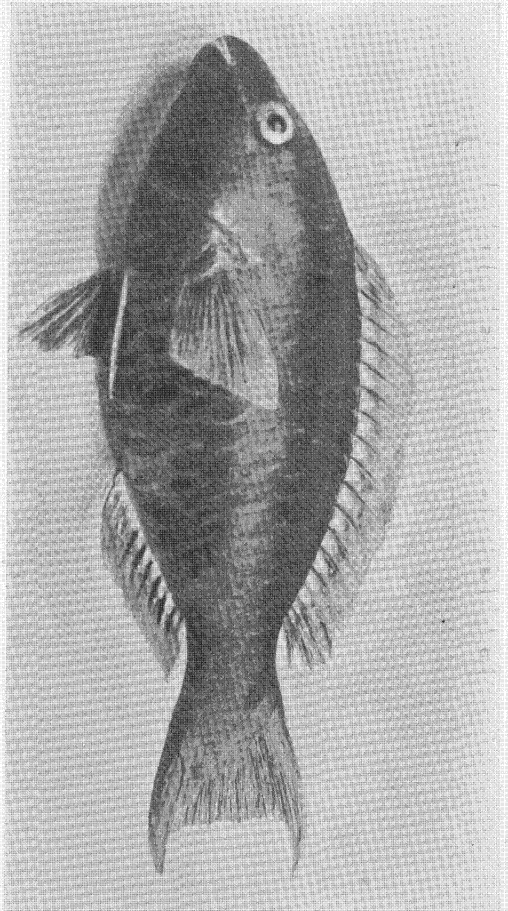


FIG. 5.—Callyodon lauia Jordan & Gilbert.

the outer half pale green; bordered with a narrow line of deep blue, the basal portion of the fin dull orange, except for a line of blue spots on the membrane between the rays; caudal with margins of the upper and lower produced rays blue; the centre of the produced rays dull orange; the central distal portion of the tail green for half its length; a narrow deep blue line of demarkation separating the green from the deep red of the central basal portion; several (8) irregular shaped green spots at the base of the tail.

The fish here described was secured in Honolulu market July 29, 1902, and is 9.5 inches long. Type B. P. B. Museum No. 3362. (Fig. 5.)

Callyodon perspicillatus (Steindachner).

Head 2.20 in body; depth 2; eye 7.75 in head; snout 2.1; interorbital 2.2; preorbital 4; D. IX, 10; A. II, 9; P. 1.25; V. 2; C. 2.5; scales 1½-26-6.

Jaws without canines; teeth white; lips short; two series of scales on the cheeks, the upper of 4, the lower of 2 scales; lower limb of opercle scaled; caudal slightly rounded, its outer rays not produced; origin of ventrals directly under posterior base of pectorals; tip of ventrals reaching more than half way from their base to the anal.

Color in formalin×alcohol. General color, dull horn gray, a dark line running along the dorsal one-quarter the height of the fin from its margin; a narrow cream-colored interorbital line; a cream-colored line enclosing a long, brownish, rectangular patch lying over the snout midway between the eye and angle of the mouth; the lower lip dirty white; a number of irregular shaped spots and stripes on the lower jaw.

Color (based on a plaster cast colored from life). The head and body back to the anterior base of anal reddish brown of various shades; the pectoral region variously vermiculated with pale greenish yellow spots; from the anterior base of anal back the body is pale greenish, with red edges to the scales, forming a net-like pattern; over the middle of the snout a long blackish patch, which is narrowly bordered with sulphur-yellow; orbits connected over the forehead by a narrow yellow stripe; eye yellow; lower lip yellowish white, becoming bluish white on the cheek where the irregular patch terminates in a deflected hook; chin and sides of

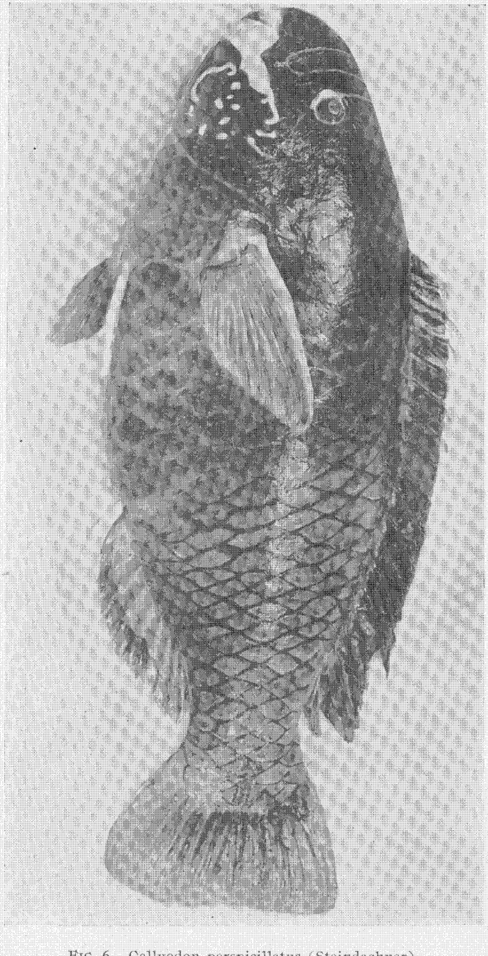


FIG. 6.—Callyodon perspicillatus (Steindachner).

the face with bent bars and blotches of bluish-white; base of the dorsal apple-green, this is bordered by a narrow dark line; the body of the fin deep orange, becoming orange-brown; first spine and margin of fin dirty white, separated from the orange by a narrow pale bluish line which becomes blackish on the posterior half of the fin; anal dirty white on its outer and anterior margin; a narrow purplish blue line separates the dirty white from the Chinese orange stripe which, rising at the base of the second spine, becomes broader posteriorly; a green wavey stripe like patch bordered all around with a narrow purplish blue line extends along the centre of the fin from the third membrane to the posterior end of the fin; basal third of anal flesh-pink; a narrow purplish-blue line at its base; pectoral dirty grayish-white on its superior margin gradually passing into pale grayish-brown; ventrals margined all round with whitish or pearl-blue; central portion ochraceous; caudal brown, grayish or reddish-brown of various shades without distinct markings.

The type specimen (B. P. B. Museum No. 3361) here described was secured in the Honolulu market Sept. 26, 1902, and is 18.5 inches long. (Fig. 6.)

Family SCARIDÆ.—Parrot-fish.

Callyodon jenkinsi (Jordan & Evermann).

Head 2.4 in body; depth 2.2; eye 7 in head; snout 2.7; interorbital 3; preorbital 5; D. IX, 10; A. III, 9; V. 16; P. 1.25; scales 1½-25-6.

Two rows of scales on the cheeks; lower limb of the opercle scaled; dorsal and anal similar in shape; head pointed; two posterior lateral canines of both the upper and lower jaw; caudal concave between the outer produced rays.

Color in formalin × alcohol. General color, dull horn-brown; the margins of produced rays of caudal, the outer margin of dorsal, the anal and ventrals pale green or greenish-blue. The forehead dull lavender; edge of upper lip, a line extending to the eye and an ill-defined spot on the chin, pale green.

Color (based on plaster cast colored from life). Scales of the trunk, bluish-green, becoming grass-green above the lateral line; all scales margined with pink; side of head and belly rosy pink;

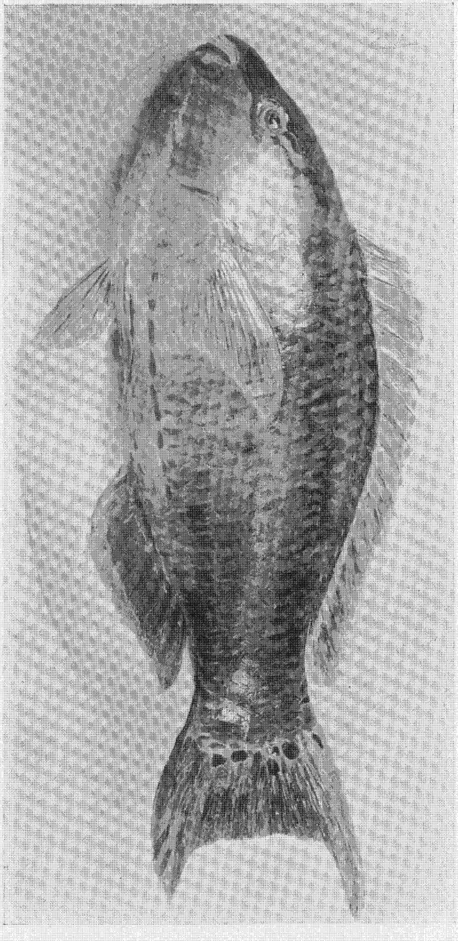


FIG. 7.—Callyodon jenkinsi (Jordan & Evermann).

belly marked with two rows of green confluent spots; longer row beginning below the base of the pectorals and extending past the anterior base of the anal; the lower line extending from the tip of the ventrals to the anterior base of the anal; forehead purple, becoming green on the crown; upper and lower lip blue; a blue-green line from the corner of the mouth back below the eye, terminating about the diameter of the eye behind it; two bent blue lines extending back from the posterior margin of the eye; base of lower lip bluish-green; chin marked with a greenish cross bar; a greenish median line extending from the lower lip to the base of the ventrals, connecting the cross markings on the lip and chin; margin of the post opercle green; iris yellow; the margin and base of the dorsal blue; between these is a broad band of dull salmon extending the whole length of the fin; pectoral with upper edge blue, the body of the fin pale green or greenish pink; ventrals edged all around with blue or blue-green, the central portion salmon pink; anal with the anterior and outer margin blue, base and posterior margin green, remaining central portion dull salmon; caudal with the outer upper and lower produced rays blue; the entire base of caudal and inner half of the produced rays purple; the terminal half of the tail between the produced rays dull salmon.

The type specimen (B. P. Bishop Museum No. 3360) here described was secured in the Honolulu market April 30, 1902, and measures 14 inches in length. (Fig. 7.)

Scaridea zonarcha Jenkins, or else new species.

Head 2.75 in body; depth 2.5; eye 4.9 in head; interorbital 4.5; preorbital about 5; D. IX, 10; A. II, 8; P. 1.33; V. 1.66; C. 1.66; scales 1½-25-7.

Teeth equal; forehead convex; 3 scales before the ventrals; origin of dorsal over base of pectoral; caudal rounded; dorsal rays the longest, truncate; ventral rays much rounded; eye about one-third its diameter below the profile of head.

Color in formalin × alcohol varied brown and blackish-brown without definite markings, save for two black spots on the dorsal membrane following the first and second spines.

Color (based on plaster cast colored from life). General color of the back and posterior half of the body reddish-brown, reddest at the occiput, brownest on the caudal peduncle; head lighter

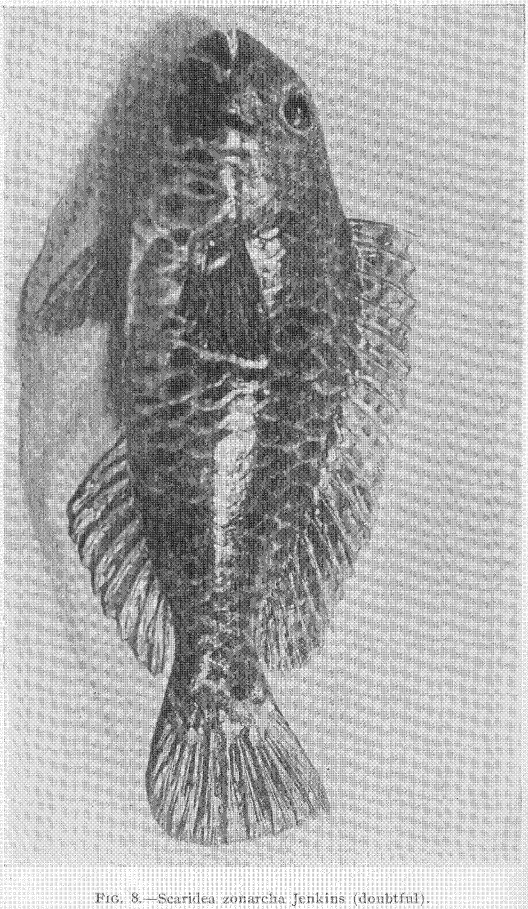


FIG. 8.—Scaridea zonarcha Jenkins (doubtful).

brown, varied with drab; a patch of orange-brown scales behind the tip of the pectoral; teeth white; iris yellow; upper and lower lip dark red; an irregular dark red patch on the side of the head, which is followed behind and below by a number of scale marks of the same color; dorsal and anal about equal in height; dorsal light brown, passing into blackish-brown posteriorly, everywhere mottled with drab and brown of different shades; a blackish spot on the first and second membrane; pectoral uniform brown: ventrals drab-brown, the outer rays bluish-drab; anal drab-brown, brownish at the margin; caudal uniform umber-brown.

The type (B. P. B. Museum No. 3366) here described was secured in the Honolulu market February 12, 1903, and is 9.5 inches in length. (Fig. 8.)

Report of a Visit to Midway Island.

WM. ALANSON BRYAN.

Introduction.

DURING the months of July and August, 1902, the writer made a voyage in the schooner Julia E. Whalen to the small and isolated Marcus Island, in the interest of the Bishop Museum, to investigate its fauna and flora.[1] On the return voyage we called at Midway, and I was thus afforded an opportunity to see this small and then seldom visited island. Since our call was the last one to be made prior to the taking over of the island as a cable station, it seems that a brief account of the observations made during the day and a half on shore will not be out of place, especially since the island had been visited but once before by an ornithologist. It is hoped that the notes here given may in the future prove of value in noting the change in the plant and bird life which will doubtless be effected through the influence of the colony that has since been permanently established there.

As a matter of convenience the Hawaiian group has been divided into the windward or inhabited islands and the leeward or uninhabited chain. It is to this latter division that Midway belongs. Beginning at Niihau, the most western of the heretofore

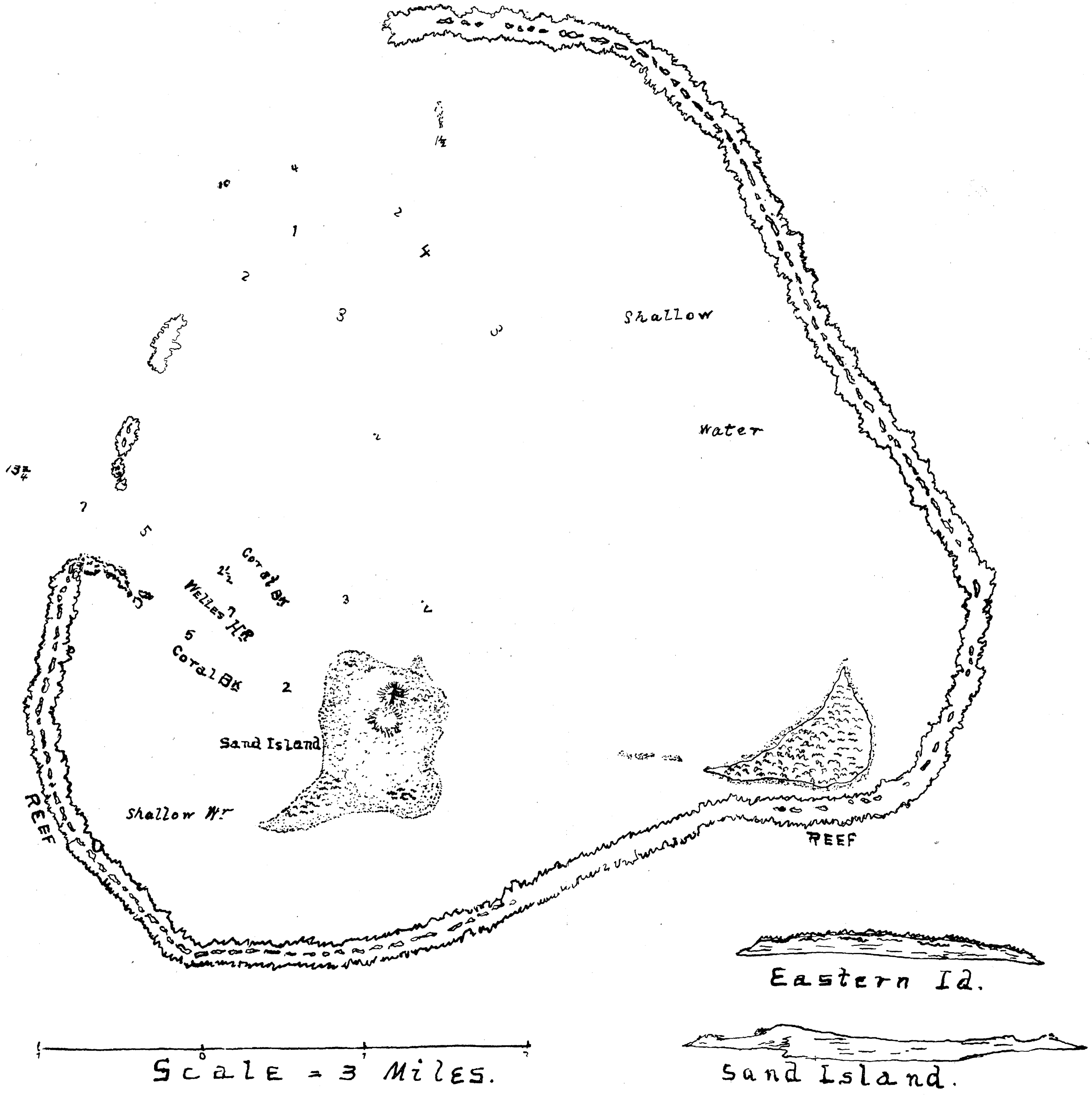
[1] Bryan. Monograph of Marcus Island. Occ. Pa. B. P. B. Mus., vol. ii, no. 1, pp. 77-140 (1903).

inhabited islands, and omitting a few barren rocks near it, the chain is composed, in the order mentioned, of Nihoa, Necker, French Frigates Shoal, Gardner, Laysan, Lisianski, Midway and Ocean Islands, together with various sunken rocks and reefs. Midway lies something over 1000 miles west by north from Honolulu (28° 12′ 22″ N., 177° 22′ 20″ W.), and is, as its name implies, near the geographical centre of the North Pacific.

For the ornithologist, interest centres about the pelagic birds which make these low coral islands their home, no less than about the migratory species which have established themselves as regular visitors. But such stragglers as may from time to time come ashore as ocean waifs on such out of the way places should always be recorded as a fact having an important bearing on the range and distribution of the species in question.

Narrative.

The return voyage from Marcus (24° 14′ N., 154° E.) was begun August 7. August 19 we crossed the 180° meridian and decided to stand down for Midway, since we were then less than 400 miles to the northwest of it. At 10 A. M., August 21, we sighted Sand, the larger of the two islets of the Midway group. When approaching the island from the north, as we did, or indeed from any direction, Sand is always the first island sighted. It is visible at a distance of not more than fifteen miles as a shimmering white strip along the horizon. On a nearer approach breakers can be seen on the reef surrounding it. By passing out well around the western end of the breakers our little vessel came safely to anchor in blue water off the wide, shallow opening in the northwest part of the reef. A boat was lowered and we began a row of more than four miles to shore. Landing on Sand Island we pulled our boat up on the beach in a little cove fronting on Wells Harbor, and went at once to the sailors' cabin close by. This cabin was built years ago from beach wood and wreckage, and has been rebuilt several times since to form shelter for shipwrecked crews that have gone ashore there. We found no signs of recent occupants, other than the cast-off garments of the colony of Japanese bird-poachers, to whose work of destruction I shall later refer. From the cabin we went to the high sand pile marked on the accompanying plan by a flag, in order to gather from that point of vantage the relation existing between the two islets and the surrounding reef.


Shallow
Water
Coral Bk
Welles Hr
Coral Bk
Sand Island
Shallow Wr
REEF
REEF
Eastern Id.
Sand Island.
Scale = 3 Miles.

Stretching from a point west by north from the spot where we stood, and extending from there about the southeast and north of us, could be seen the line of encircling breakers. Coral rocks awash were visible on the reef almost the whole way around. Thus, on the sides mentioned is formed an irregular coral barrier which is about six miles in its greatest diameter. To the northwest of our point of observation the reef is broken up or wanting. The entrance to the lagoon and into Wells Harbor is at the extreme south side of the open portion of the reef, and is about three-quarters of a mile in width. The remaining northern portion is very shallow, with narrow tortuous channels through the masses of submerged coral rock.

Well to the south and east of this lagoon enclosure are located the two bits of land which are designated as Sand and Eastern Island respectively. The one which served as a point of general observation is little more than a barren, blinding heap of sand, of irregular and constantly varying form, forty-three feet high; one mile and a quarter long by three-quarters broad more or less. Here and there the sand has been heaped up in piles a few feet high by the wind. On the top of most of these dunes a few hardy shrubs and grasses manage to subsist, and form the only relief for the eye in what is little else than a waste of shifting sand. Not far from the sailors' cabin referred to were a few graves, marked by three rude wooden crosses, which added the last touch to a picture of desolation such as I had never before witnessed.

To the east a mile or more, but connected with Sand Island by a narrow submerged sand spit lies Eastern Island. Its roughly formed triangular outline can be seen from so slight an elevation as that on which we stand, for it is nowhere more than twenty-five feet above sea level. Compared with the island just described it presents an interesting contrast, for it is clothed in green down to the beach, and differing thus in its flora, it differs still more in the number of birds which inhabit it. What freak of old ocean has placed these two specks of land side by side, under apparently the same conditions, and has covered the one with low shrubs, creeping plants and grasses, and has left the other an uninviting heap of sand? Eastern Island is smaller than its neighbor, being approximately one mile and one-quarter in length by half a mile wide in the broadest part. The centre is a trifle lower than the

edges, which gives it the general form of a broad, flat platter. Although composed of coral and coral sand it differs from Sand Island in having the interior portion mixed to some extent with vegetable mould and guano. Almost the whole surface of the island is honeycombed with the burrows of the Wedge-tailed Shearwater. Near the middle, on the northwest shore, were three crude shanties, two made of wood and one of grass. These had been standing a considerable time, and had doubtless been built by the Japanese poachers during some of their early visits.

Midway was discovered by Captain Brooks, of the Gambia, in 1859, who took possession of it for the United States. At one time the Pacific Mail Steamship Company intended using it as a depot for its transpacific steamers in preference to Honolulu, which was then under foreign influence. With this plan in view it was surveyed in 1867, but it was never utilized for the purpose intended. It was again carefully surveyed by the officers and men of the U. S. Iroquois in 1900, and an elaborate map, showing several thousand soundings, has been published. The second survey was made preparatory to the establishment of a cable and naval station there, which now gives the island an importance far out of proportion to its area.

The island has been repeatedly visited by small tramp vessels, and has more than once been the haven for shipwrecked sailors. However, it was not until Mr. Henry Palmer visited it in July, 1891, that the nature of its bird life was definitely made known, although all those who visited it made frequent reference to the swarms of sea birds that inhabited it.

Limited as our stay was to but a few hours, the following can be regarded as little more than a running list of the plants and birds which we were able to secure in a short time. Doubtless both the number of plants and birds could be increased without difficulty, while a protracted stay on the island would no doubt bring to light many interesting records of rare visitors, as well as record forms of bird life which would be common enough at other seasons of the year.

On the two islets I collected, in all, eleven species of plants, securing six on Sand and ten on Eastern. With the exception of a single species, *Eragrostis cynosuroides* (Retz), all the plants secured on Sand Island were found growing on Eastern. The

more important plants determined for Midway are: *Cenchrus calyculatus* Cav., *Boerhaavia tetrandra* Forst., a variety near *Lepidium oahuensis* Chan. I. Schl., *Capparis sandwichiana* DC., *Ipomœa insularis* Stend., *Scævola kœnigii* Vahl., *Tribulus cistoides* Linn., and *Eragrostis cynosuroides* (Retz). In addition to the above are three widely distributed beach plants, two of which are grasses that are as yet undetermined.

List of Birds.

LARIDÆ.

Sterna fuliginosa Gmel.—**Sooty Tern.**

Under the low *Scævola* bushes on the eastern end of Sand Island was an extensive colony of Sooty Terns that were rearing their young. They were in about the same stage of development as I had found them on Marcus Island. On Eastern the colony was much larger than on Sand Island. This was doubtless due to the more abundant growth of shrubs and grass, which was thick enough to furnish some protection from the sun. Although I made diligent search, only one egg, an infertile one, was found. From what I have seen on the outlying islands I conclude that all the colonies of Sooty Terns in the North Pacific nest at or near the same time. A good series of skins was secured.

Mr. Palmer spent a week on the island (July 11 to 19) without seeing the Gray-backed Tern, *Sterna lunata* (Peale). It is a peculiar freak in distribution that this species should be met with on all the low islands except Midway, but during my sojourn I did not see a single example, although here, as at Marcus, I was especially on the lookout for it.

Anous stolidus (Linn.).—**Noddy.**

There were but few examples of this species on either island. The few nests found were built on the ground, usually under the shrubs which grew on top of the sand mounds. The young were still in the down.

Micranous hawaiiensis Roths.—**Hawaiian Tern.**

Only a little colony of a dozen or twenty individuals were seen on Sand Island. These were huddled together sitting on the low bushes on a sand mound. I have observed that birds of this species seldom leave the place where they have been reared, so that when

disturbed they rise and circle gracefully about for a time, but always return to the same spot. When they alight they all sit facing the wind.

On Eastern Island I found a number of colonies of different sizes distributed here and there over the island. All of the twenty birds shot had the feet black in life. A nest located in the bushes toward the centre of Eastern Island may be taken as typical of all seen; it is a rather bulky structure composed for the most part of sea moss, to which were added twigs, leaves, bits of sponge, etc. All of the material is cemented together with the droppings of the bird. The nests were always placed in colonies of a dozen or more, and the fully fledged young were usually sitting on the bushes. But a single egg, which proved to be infertile, was found close by, and as the nests contained no young it would seem that this species nests earlier than the other Terns on the island.

The Hawaiian Tern seldom goes far out to sea. It is always to be seen in small flocks sailing about over the reefs in search of surface-swimming fish, which constitute its chief food.

Gygis alba kittlitzi Hartert.—**White Tern.**

This fearless and inquisitive bird was by no means abundant on Sand Island. The few found were sitting with their young in the bushes on the sand piles. Specimens secured were taken without difficulty by the hands. On Eastern Island the birds were more abundant. No eggs were collected, but one newly hatched young was secured. Young which were assuming the first plumage were quite common.

DIOMEDEIDÆ.

Diomedea immutabilis Roths.—**Gooney.**

There were the carcasses of a very few birds on Sand Island which had evidently been killed several months before our visit. On Eastern Island skeletons of this species were more common, but they were by no means as plentiful as those of the following species. I should say that the Gooney was less than a third as abundant as the Black-footed Albatross, judging by the number of dead bodies of each to be seen. None of our party saw a living bird of either species.

Diomedea nigripes Aud.—**Black-footed Albatross.**

Everywhere on Eastern Island great heaps, waist high, of dead albatrosses were found. Thousands upon thousands of both species had been killed with clubs, the wing and breast feathers stripped off to be sold as hat trimmings, or for other purposes, and the carcasses thrown in heaps to rot. After my acquaintance with the colony of bird pirates on Marcus Island it was but too apparent that a similar gang had been in full operation at Midway not many months prior to our visit, and that they had worked sad havoc among the birds there, in spite of the severe warning which had been given by Captain Niblack, of the Iroquois, to a party similarly engaged the season before. The work of exterminating the Midway colony was surely well under way, and I was convinced that unless something definite was done, and that at once, to prevent such wanton destruction, before long this colony of albatrosses, as doubtless all those on the low outlying islands, would be wiped out precisely as the one on Marcus Island had been.

On my return to Honolulu I took the matter up with the proper officials in Washington, among others addressing a letter to the Chief Executive, with the result that the subject was brought to the attention of the various cabinet officers concerned. With the cooperation of Dr. Henry Palmer, of the U. S. Biological Survey, together with the energetic services of Mr. Wm. Dutcher, President of the Audubon Societies, to whom the whole matter of bird protection for the Pacific had been presented in person by the writer, most satisfactory results have been obtained. A naval vessel will in the future make at least two patrol trips each year to the outlying islands of the Hawaiian group to break up or prevent further depredations. The officers and men stationed on Midway have strict orders to protect the bird colonies there. The fishing rights to certain of the outlying islands will only be let by the Territory, with special clauses protecting the bird colonies thereon; while the Japanese Government will in future refuse to allow predatory hunting and fishing vessels to leave Japanese ports.

PROCELLARIIDÆ.

Priofinus cuneatus (Salvin).—**Wedge-tailed Shearwater.**

This species was only occasionally met with under the bushes on the mounds on Sand Island, while on Eastern the whole interior

of the island was honeycombed by their burrows. They were so numerous indeed that crossing the island in any direction was a difficult task by reason of one dropping, unexpectedly, hip deep in them, only to climb out of the sand to repeat the experience again and again. They were abundant birds, everywhere dodging beside their holes, or stowed away in them. Several downy young but no eggs were secured.

The absence of the Christmas Island Shearwater, *Puffinus nativitatis* Streets, was another mystery in distribution. Having found it fairly common on Marcus Island, sitting beside its half grown young under the trees, and knowing that it had been met with at French Frigates Shoal and Laysan I fully expected to find it at Midway, especially on Eastern Island where the conditions are fully as favorable for its nidification as they are on Laysan. I am at a loss to account for such a freak in distribution, except it may be that the bird has a great attachment for the locality where the young is reared, and even though it knows of and possibly visits other islands equally suited to its habits, always returns to its own island to in turn rear its young. If such is the case it would indicate the difficulty of establishing new colonies or restocking old ones by artificial means.

PHAETHONTIDÆ.

Phaethon rubricauda Bodd.—**Red-tailed Tropic Bird.**

A few birds of this species were met with on both islets. All had young in the down, for which they would fight most savagely when molested.

SULIDÆ.

Sula piscator (Linn.).—**Red-footed Booby.**

A single individual, which had evidently been left behind when its neighbors took their leave of the island, was seen asleep on the bushes on Sand Island. I captured it in my hands. It was the only example seen by any of us.

Sula cyanops (Sund.).—**Blue-faced Booby.**

A number of this species was seen and a specimen was collected.

FREGATIDÆ.

Fregata aquila Linn.—**Man-o'-war Bird.**

There was quite a large colony of Man-o'-war Birds nesting on the top of the bushes on Eastern. Twenty-eight nests were counted all within a space a few rods square. The clatter of the bills of the downy young birds as one entered the colony was most interesting and curious.

SCOLOPACIDÆ.

Numenius tahitiensis (Gmel.).—**Bristle-thighed Curlew.**

The Curlew was quite common on the shore of Eastern Island, where I had little difficulty in securing a series of twelve specimens.

Arenaria interpres (Linn.).—**Turnstone.**

The Turnstone was met with on both islands at Midway.

RALLIDÆ.

Porzanula palmeri Frowh.—**Laysan Island Rail.**

A number of years ago Captain Walker, of Honolulu, carried a cage of the Laysan Rails down to Midway and liberated them on Eastern Island. They have multiplied until, at the time of our visit, they were almost as abundant there as they are on Laysan. A single immature specimen was taken, which, when compared with a large series in the Museum from Laysan, exhibits differences in coloration which would lead one unfamiliar with the circumstances of its introduction to separate it by a specific name.

August 26, 1905.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF
POLYNESIAN ETHNOLOGY AND
NATURAL HISTORY.

VOL. II.—No. 5.

Director's Report for 1906.

WITH

INDEX TO VOL. II.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1907.

REPORT.

THE past year has been one of external rather than internal activities, and although the various departments show a considerable increase and are generally in a creditable condition, it is fair to say that what the Museum staff has done outside the Museum walls is far more important and far more beneficial to the well-being of the Institution.

Last year the Trustees liberally granted Dr. C. M. Cooke, an opportunity to study the type specimens of Hawaiian Land Shells that are in foreign museums or private collections, and his absence on this (which may truly be called an exploring expedition) has extended over the principal part of the year 1906. His report is incorporated with this and will show how important the work of comparison has been in its relation to the most important zoological group on these islands. Dr. Cooke's visit to many of the principal conchologists of England and America will doubtless result in enlarged opportunities for exchange of specimens and mutual information. Simultaneously with this work the Museum has been printing a compilation of original descriptions of Hawaiian Achatinellidæ, which will be another help to the study of this interesting group.

Early in the year the Carnegie Institution of Washington made a grant to the Director to enable him to continue his researches on Hawaiian worship which seemed to demand a greater outlay than the Museum funds could well spare from the general expenses of maintenance. The specific grant was made for the

exploration of the *heiau* of which the remains in a more or less ruinous state are scattered over the group. While they were built in the littoral, then the most populous portion of the islands, changed conditions have often left these ruins in almost deserted regions where they are often concealed and protected by a dense overgrowth of brush, or with the onset of modern "improvements" the stones of these once sacred piles have been ground in rock-crushers to make material for roads, or they have not less passed out of existence as historical relics by their use as foundation stones for mills, or walls for cattle pens.

Tradition has gathered around these sites of a once all-powerful cult, but the natives who could have given us history instead of tradition have gone, and the ruined and neglected condition of the old temples renders their identification and survey very difficult, and in many cases only a considerable knowledge of the ancient liturgy and priestly customs enables us to unravel the confusion existing from ruin or from additions or adaptations for more modern uses. Hence the expense of such an investigation is considerable and beyond the means of most scientists.

To the grant of the Carnegie Institution the Trustees of this Museum have generously added permission to use Museum resources in the way of surveying and exploring, and Mr. John F. G. Stokes, Curator of Polynesian Ethnology, after some examination and measurement of heiau on this island, proceeded to Hawaii with full camping outfit, and for several months has in the most thorough manner identified sites, where ruins no longer exist, measured and mapped all existing ruins, and connected these with the trigonometrical stations of the island. A fuller report of his work will be given later when the heiau of the other islands shall have been explored, but the completion of the circuit of the largest island of the group is a definite achievement that has added greatly to the list of these ancient temples; but what is of more importance has revealed a wonderful variety in plan, and great labor and some

skill in building these sacred places of a people greatly embued with a love of religious observances. Mr. Stokes' work will be a great credit to this Museum as well as to himself. It is unfortunate that it could not have been done years ago, for the almost illegible ruins are now most puzzling, and in many cases the puzzle cannot now be solved.

The Director had hoped that this year would see the most comprehensive exploration of the whole Pacific region that has ever been undertaken at least inaugurated by this Museum, an institution situated in the very midst of this region; one that has from very small beginnings risen with rapid flight to a respectable position among working museums; one founded for such work, and one that has been built up with such an object constantly in view until it seemed ready and fitted to begin the great work. It is quite true that the present buildings of the Museum are wholly insufficient for such work, insufficient indeed for the routine work and storage accommodation of such collections, but plans were carefully prepared and submitted to the Trustees to in great measure supply this deficiency. But while these plans and estimates were receiving the deliberate consideration due so large a proposed expenditure, came the terrible San Francisco earthquake, and the subsequent great rise in the cost of materials seemed to forbid, for the moment, the prosecution of the building.

Even with the desired Laboratory and Library, it was well understood that with the present Museum endowment the complete control of such a vast undertaking could not be thought feasible, but it was hoped that if sufficient funds could be obtained the Museum might not only stand sponsor, but lend its library and collections to the furtherance of so good and important a work.

The Director did not plunge into this scheme suddenly or without due reflection. Forty years ago, when crossing the North Pacific on the good ship Oracle, plans were formed based on a previous exploration of the Geology and Botany of this Hawaiian

Group, to cover at least all Polynesia. Sketches, still in existence, of a vessel thought to be suited for this work were drawn under the advice of Captain Woods, a skilful navigator and scientist, and the young students of science lately associated with the writer as students in Harvard, who seemed best fitted to take charge of the several departments, were selected. The scheme never materialized, and the names of these young men did not beome famous through Pacific exploration; but it is a matter of pride to the dreamer of those days that all of them did become distinguished in scientific pursuits, and have done good work as teachers in our foremost universities.

The early plan was not wholly lost, for with the foundation of this Museum the intangible became concrete, and I believe that there can be no better preparation for the thorough exploration of a region than a comparative study of the products of peoples both physical and psychical: their implements, arms, houses: their domestic and social economy, their religion and language, such as a curator of a considerable museum devoted to such matters must be to a greater or less extent master of. The Trustees of this Museum encouraged this, perhaps unconsciously, by printing the card catalogue of Pacific Islands that had been formed to help an orderly study of the Museum collections. They have helped on the good work to a greater or less extent by every Memoir they have published describing the works of man or the creations of God in this region. The publications of Societies all over the world that come to us by exchange or purchase have kept us *au courant* on what ethnologists, zoologists, botanists and geologists have gathered from this island world, and conversely what they still need. The methods of investigation, tested in similar climates and for cognate purposes have been eagerly followed and their adaptability to our region settled, where possible, by direct experiment. Other studies have been undertaken, that it would be tedious to even enumerate in this report, until it has been found

possible to estimate the time required, the number of men in each division of the work, the tools needed, and the probable result. Of course to lay this before the Trustees in a complete form would require more space than even the largest of these annual reports affords, and until the funds to set the machinery in motion are in sight it would be profitless to do this. It may, however, be stated that an annual income of at least $450,000 would be needed, extending over at least fifteen years, and the published results, using brevity and condensed illustration, would fill a hundred quarto volumes of seven to eight hundred pages. Several hundred young men would be engaged in the work of exploring, while the leading men in each department would check the results. An extensive correspondence has shown this to be possible, but it is not surprising that the magnitude of the scheme has caused the Trustees to hesitate to embark this Museum in the undertaking until the money basis is settled. On any less foundation it would be folly to undertake the work, even from an ethnological standpoint, for the evidence to be sought is so rapidly disappearing that only by throwing a small army of observers in the field at once can much be accomplished; on the score of economy the other divisions of a complete exploration should be conducted simultaneously.

It was a source of gratification to the Director that he could, last spring, call the attention of many scientific men and educators to the great need of such a survey, and to find that all agreed with him that an exploration was desirable, and that Honolulu, if not this Museum, was the proper centre of direction. From Sydney, N. S. W., and Florence in Italy came on the same day warm approval of such a survey from two most distinguished ethnologists and museum directors. From the warm sympathy and approval of many men of note and influence, extracts from whose letters have been otherwise brought to the attention of the Trustees, the Director may be pardoned for the belief that the survey will yet become a reality, and that this Museum will greatly profit by the work.

To return to the internal condition of the Bishop Museum. The gentlemen of the staff have welcomed back to their number Mr. J. W. Thompson, our formatore and artist after an absence of a year, and have greatly regretted parting with their colleague of some years Mr. W. A. Bryan, Taxidermist and Curator of Ornithology, who resigned in April to go in quest of funds to establish a proposed Pacific Scientific Institute. His attractive groups of bird life in the gallery of Hawaiian Hall, as well as his usefulness in many ways will give him an honorable place among the builders of this Museum, and a suitable successor will be hard to find. Mr. H. F. Sturtevant was appointed temporary assistant during the summer vacation, and, as on a former occasion, was very successful in his work.

The Museum Press, in charge of Mr. J. J. Greene, has issued two Memoirs, constituting two parts of Volume II of the Memoirs, entitled "Mat and Basket Weaving of the Ancient Hawaiians," by William T. Brigham, and "Hawaiian Nets and Nettings," by J. F. G. Stokes, (No. 1) pp. 162, with 166 illustrations in the text and 16 plates, one colored; and "Old Hawaiian Carvings found in a cave on the Island of Hawaii:" by William T. Brigham, (No. 2) 20 pp., with 21 illustrations in the text and 1 plate. Two Occasional Papers,—the "Director's Report for 1905," pp. 45, with 8 illustrations and a map; and "Fishes of the Southeastern Pacific:" by Alvin Seale, pp. 89, and 23 plates. It is believed that the high standard adopted by this department has been fully sustained by the printer.

In addition to his work in his especial department of Polynesian Ethnology, where he has expended considerable labor in caring for our large collections, and has examined and appraised several important private collections of Hawaiian antiquities, Mr. J. F. G. Stokes has mounted in a very satisfactory manner a considerable portion of the fine collection of the Hawaiian Corals made by Messrs. Stokes, Cooke and Duerden, and identified and

named by Dr. Vaughan of the National Museum, Washington. A number of new species was the result of this examination. Mr. Stokes' work in surveying the ruined temples of Hawaii has already been mentioned.

Dr. Cooke's work can be seen by reference to his report, but his modesty has concealed the real extent of work done for the Museum in the hot summer time in Philadelphia. His notes on Hawaiian shells, transcribed from books not in our library, give us the equivalent of a large number of volumes for working material in the study of our molluscan fauna. It is to be hoped that other results of his careful and laborious work will shortly appear in our publications.

Mr. L. G. Blackman, as Librarian, has helped the growth of our library, and has prepared more than 500 volumes for the binder. The list of accessions to the library will show that some very valuable works have been added both by purchase and exchange. Mr. Blackman has also, during the absence of Mr. Stokes, attended to the accounts and registry.

Mr. J. W. Thompson has continued his very successful work of casting and painting the Hawaiian fishes and has added a number of rare specimens to our collection, which now numbers about 175, with many casts not finished. Several of the casts are of fish not described in the report of the United States Fish Commission. Mr. Thompson has also made casts of uncommon fruits such as the Durian, sent to us by Hon. S. W. Wilcox of Kauai; Mamee Apple from St. Louis College; the Bel from Aubrey Robinson, Esq., of Kauai; the Lucuma, from Mr. E. W. Jordan, of Honolulu. We may hope to have, in time, a large collection of tropical fruits in casts remarkably true to Nature, and durable as well.

The attendance of visitors for the year has not equalled that of 1905 by 2802. This has been partly due to the stormy month of December, when the attendance was hardly one-half the average. The number of tourists has greatly decreased, and also the

number of school children visiting the Museum. For the last three years the numbers have been :—

	Whites	Hawaiians	Portuguese	Chinese	Japanese	Others	Totals
1904	5077	2216	776	2384	2178	41	12,672
1905	5711	2173	620	2527	2992	273	14,296
1906	4659	1499	584	2101	2265	386	11,494
Change from last year:							
	1052—	674—	36—	426—	727—	113+	2802—

The class "others" includes Koreans, Philipinos and negroes. Of each of these an increase has been noted the past year.

TABLE OF ATTENDANCE.

1906.	Whites.	Hawaiians.	Portuguese.	Chinese.	Japanese.	Others.	Open on		Visitors on closed days.	Average Attendance.		Total Visitors.
							Public days.	Other days.		Public days.	Other days.	
January	453	82	34	560	57	20	9	5	32	130	6	1206
February	445	76	45	250	190	30	9	6	27	112	4.5	1036
March	657	172	44	144	185	58	10	6	111	115	18.5	1260
April	344	110	56	124	235	23	8	4	11	110	3	892
May	296	124	43	111	167	24	9	5	68	77	14	765
June	377	98	53	141	244	34	11	3	23	85	8	948
July	258	100	51	87	182	13	9	3	6	79	2	690
August	392	120	62	235	211	42	9	5	32	115	6	1062
September	402	134	43	177	266	28	10	7	46	110	7	1050
October	292	135	98	121	243	45	8	6	33	113	5	934
November	477	274	41	100	173	47	9	8	40	119	5	1112
December	266	74	14	51	112	22	9	3	28	57	9	539
Totals	4659	1499	584	2101	2265	386	110	61	457	100.3	7.5	11,494

Dr. Cooke's Report.

DR. WILLIAM T. BRIGHAM.

DEAR SIR: — Inclosed please find a report on the results of my trip to study the types of our Hawaiian Land Shells. As you can see, we now have specimens of a majority of the species of the less known genera of our shells. About one hundred, more or less, new species are in our collection and are to be described as soon as the different genera are worked up. The types of these new species are to be in our collection. I wish to thank you for the encouragement you gave me and, also, for the extended time to complete the list of descriptions not in our library, and to work with Dr. Pilsbry, this part of the trip occupying the major portion of the time will probably, in future results, prove to be the most important part of the trip. Yours truly,

C. MONTAGUE COOKE JR.

THE trip, of which the following is a report, was begun in the early part of September, 1905. The object of this trip was to study the types of the smaller and less known species of our land shells. During a previous trip, in 1900, the types of the arboreal species had received attention and careful notes made of the type specimens, especially those of Pfeiffer, Newcomb, Smith and Sykes.

The genera, Leptachatina, Auriculella, Tornatellina, Nesopupa, Endodonta, Philonesia, etc., are very well represented in our collection. The series, belonging to these genera, is probably the best in any collection, and contains a large number of undescribed species. In working up our collection the writer had considerable trouble in identifying a number of species, as a number of them are insufficiently described and in most cases unfigured. A thorough knowledge of these species was therefore necessary before publishing the many new species belonging to our collection.

On receiving the consent of the Director and the Trustees of the Museum, a series was made of all the species and possible varieties belonging to these genera in our collection. Two note books were prepared, one containing a list of all the species and varieties published up to the time of leaving; the other a list of the shells taken along and the probable identification of some of

the species. The note books were not finished before leaving: this was accomplished on the mainland.

On completing the note books a trip was taken to Washington to study the types of Gould and Mighels in the Smithsonian Institution. Specimens, in our collection, agreed with the following species: Godwinia caperata Gld., G. tenella Gld., Vitrea pauxillus Gld., Philonesia cicercula Gld., P. subtilissima Gld., Endodonta rubiginosa Gld., Leptachatina guttula Gld., L. striatula Gld., Carelia adusta Gld., Tornatellina peponum Gld., Amastra nucleola Gld., Limnæa rubella Lea, L. volutata Gld. and Helicina uberta Gld.

The following species were not in our collection. Notes were made and the nearest agreeing species were compared and the differences noted: Microcystina cryptoportica Gld., Philonesia subrutila Migh., Endodonta stellula Gld., Leptachatina accincta Migh. (the specimen, figured in the Exp. Exp., Moll., pl. vii, fig. 97, proved to be L. ventulus Fér.), L. acuminata Gld. (the type and only specimen, which is also the type of the genus, is badly broken), L. cerealis Gld., Opeas junceus Gld., Succinea explanata Gld., S. venusta Gld. and Helicina laciniosa Migh.

The next trip was to Dra-el-Mizan, in Algeria, to study the types in the collection of M. Ancey. One hundred and fourteen species and varieties of our shells are credited to this author. Since returning, word of M. Ancey's death has been received, and it is fortunate that the trip was taken in time, as he identified a number of his species in the collection taken along. The following species of M. Ancey were represented in our collection: Vitrea hawaiiensis Anc., V. baldwini Anc., Philonesia abeillei Anc., P. turgida Anc., P. baldwini Anc., P. lymanniana Anc., P. platyla Anc., P. sericans Anc., P. rufobrunnea Anc., Endodonta nuda Anc., E. henshawi Anc., E. thwingi Anc. (MS.), E. hystricella var. paucilamellata Anc., Pterodiscus digonophorus Anc., P. petasus Anc., Nesopupa acanthinula Anc., N. baldwini Anc., N. baldwini var. centralis Anc., N. carbonifera Anc., N. clathratula Anc., N. kauaiensis Anc., N. magdalenæ Anc., N. magdalenæ var. prisca Anc., N. plicifera Anc., N. wesleyana Anc., N. mirabilis var. hawaiiensis Anc., Pseudohyalina meniscus Anc., Punctum horneri Anc., Leptachatina columna Anc., Carelia dolei Anc., C. sinclairi Anc., Auriculella canalifera Anc., A. malleata Anc.,

A. obliqua Anc., A. ponderosa Anc., A. tenella Anc., A. tenuis var. solida Anc., A. westerlundiana Anc., Tornatellina abbreviata Anc., T. baldwini Anc., T. cincta Anc., T. cyphostyla Anc., T. extincta Anc., T. fusca Anc., T. henshawi Anc., T. macromphala Anc., T. macromphala var. producta Anc., T. procerula Anc., T. pyramidata Anc., T. rudicostata Anc., T. subangulata Anc., T. terebra Anc., T. umbilicata Anc., T. hawaiiensis Anc. (MS.), T. virgula Anc. (MS.), Geostilbia baldwini Anc., Succinea baldwini Anc., S. bicolorata Anc., S. canella var. lucida Anc., S. casta Anc., S. cinnamomea Anc. (MS.), S. garrettiana Anc., S. inconspicua Anc., S. thaanumi Anc., S. kuhnsi Anc., S. quadrata Anc., Helicina baldwini Anc., H. dissotropis Anc. and H. sulcuosa Anc.

The species not in our collection were: Philonesia cicercula var. bœttgeriana Anc., P. hartmanni Anc., P. indefinita Anc., P. oahuensis Anc., P. oahuensis var. depressiuscula Anc., P. plicosa Anc., Nesopupa mirabilis Anc., N. thaanumi Anc., Leptachatina isthmica Anc., Thaanumia omphalodes Anc., Tornatellina euryomphala Anc., T. macroptychia Anc., Succinea apicalis Anc., S. arulenta Anc., S. canella var. crassa Anc., S. canella var. mamillaris Anc., S. canella var. obesula Anc., and S. waianaensis Anc.

The following species were not seen, a few of them not being in M. Ancey's collection: Philonesia perlucens Anc., Endodonta apiculata Anc., E. baldwini Anc., Nesopupa microthauma Anc., Leptachatina approximans Anc., Carelia fuliginea var. saturalis Anc., C. turricula var. azona Anc., Succinea delicata Anc., S. lutulenta Anc., S. mauiensis Anc., S. casta var. orophyla Anc., S. casta var. henshawi Anc., S. tetragona Anc., Limnæa aulacospira Anc., and Melania baldwini Anc.

Carelia glutinosa Anc. is not Hawaiian; the habitat is probably South Africa. Endodonta elisæ Anc. and Succinea souleyeti Anc., are probably not Hawaian, as their habitats are not known.

The next trip was to London to study the types in the British Museum. Those seen, with which examples agreed, were: Godwinia newcombi Pfr., Vitrea molokaiensis Sykes, Pseudohyalina kauaiensis Pfr., Microcystis chamissoi Pfr., Philonesia disculus Pfr., P. obtusangula Pfr., P. perkinsi Sykes, Endodonta fricki Pfr., E. hystricella Pfr., E. lanaiensis Sykes, Nesopupa newcombi Pfr., Leptachatina arborea Sykes, L. chrysallis Pfr., L. clara Pfr.,

L. conicoides Sykes, L. convexiuscula Sykes, L. dentata Pfr., L. dimidiata Pfr., L. elevata Newc., L. emerita Sykes, L. fumosa Newc., L. fusca Newc., L. glutinosa Pfr., L. gracilis Pfr., L. henshawi Sykes, L. konaensis Sykes, L. labiata Newc., L. margarita Pfr., L. nitida Newc., L. obclavata Pfr., L. perkinsi Sykes, L. pyramis Pfr., L. sandwicensis Pfr., L. sculpta Pfr., L. semipicta Sykes, L. smithi Sykes, L. vanna Sykes, L. vitrea Newc., Carelia cochlea Reeve, C. cummingiana Pfr., C. fuliginea Pfr., C. newcombi Pfr., C. obeliscus Reeve, Auriculella brunnea Smith, A. cerea Pfr., A. crassula Smith, A. diaphana Smith, A. lurida Pfr., A. patula Smith, A. perkinsi Sykes, A. tenuis Smith, Tornatellina compacta Sykes, T. cylindrata Sykes, T. newcombi Pfr., T. perkinsi Sykes, T. trochoides Sykes, Opeas henshawi Sykes, Succinea konaensis Sykes, and Ancylus sharpi Sykes.

The following species were not in our collection: Vitrea lanaiensis Sykes, Kaliella konaensis Sykes, Leptachatina callosa Pfr., L. corneola Pfr., L. impressa Sykes, L. obsoleta Pfr., L. obtusa Pfr., L. oryza Pfr., L. semicostata Pfr., L. succincta Newc., L. supracostata Sykes, L. teres Pfr., Carelia paradoxa Pfr., Auriculella chamissoi Pfr., A. newcombi Pfr., A. obeliscus Pfr., A. petitiana Pfr., Frickella amoena Pfr., Tornatellina confusa Sykes, and Succinea protracta Sykes.

The types not seen were: Endodonta binaria Pfr., Leptachatina granna Newc. ("type smashed in 1898"), and L. imitatrix Sykes ("type probably lost").

The first trip, after returning to New York, was to Philadelphia to see the types of Pilsbry and Baldwin. Those of which we have specimens are: Endodonta concentrata P. & V., E. thaanumi P. & V., E. luctifera P. & V., E. kamehameha P. & V., E. marsupialis P. & V., Opeas opella P. & V., and Limnæa hawaiensis Pils.

While in Philadelphia, Dr. Pilsbry suggested that all the published papers relating to our land shells be gone through and the most important, which are not in our library, be copied. Permission was received for extended leave to accomplish this.

Boston was next visited to study the types in Pease's collection in the Museum of Comparative Zoology at Cambridge, and also those in Gulick's collection in the Museum of the Boston Society of Natural History. The types of Pease's species, with which specimens in our collection agreed, were: Endodonta de-

cussatula Pse., E. laminata Pease., E. rugata Pse., Nesopupa perlonga Pse., N. costulosa Pse., Leptachatina balteata Pse., L. cylindrata Pse., L. lævis Pse., L. pachystoma Pse., L. simplex Pse., L. tenebrosa Pse., L. turgidula Pse., Carelia olivacea Pse., Auriculella ambusta Pse., A. expansa Pse., A. pulchra Pse., A. triplicata Pse., Tornatellina aperta Pse., T. dentata Pse., T. gracilis Pse., T. oblonga Pse., and Succinea elongata Pse.

Types seen, but of which we did not have specimens, were: Endodonta capillata Pse., E. paucicostata Pse., Nesopupa striatula Pse., and Carelia variabilis Pse.

The types of some of Pease's species could not be found. It is possible that a number of the following are lost: Endodonta distans Pse., Pterodiscus depressiformis Pse., P. prostrata Pse., Nesopupa bacca Pse., N. costata Pse., Leptachatina antiqua Pse., L. brevicula Pse., L. compacta Pse., L. costulosa Pse., L. extensa Pse., L. lucida Pse., L. tenuicostata Pse., Carelia adusta var. angulata Pse., Auriculella uniplicata Pse., Succinea rubella Pse., S. rubida Pse., Limnæa ambigua Pse., L. compacta Pse., L. turgidula Pse., Melania contigua Pse., M. kauaiensis Pse., and Neritina neglecta Pse. Fortunately authentic specimens of a number of these were found in the collections of other museums.

Of Gulick's species we had the following: Leptachatina fumida Gul., L. fuscula Gul., L. gummea Gul., L. lachrima Gul., L. lagena Gul., L. leucochlia Gul., L. petila Gul., L. stiria Gul., L. vitreola Gul., and Auriculella perpusilla Smith (the type and only specimen in the collection being unfortunately broken).

The species not represented in our collection were: Leptachatina costulata Gul., L. exilis Gul., L. fragilis Gld., L. marginata Gul., L. octogyrata Gul., L. parvula Gul., L. resinula Gul., L. saxatilis Gul., L. striatella Gul., L. subula Gul., L. terebralis Gul., L. triticea Gul., and L. turrita Gul.

The next trip was to Ithaca to see the collection of Newcomb in the museum of Cornell University. The shells in this collection agree closely with his types in the British Museum. Unfortunately a few of Newcomb's own species are not in his collection. Leptachatina striata Newc. could not be found. The type of this species was probably in the California Academy, and, if so, is lost.

Albany was next visited to study Gould's collection in the New York State Museum of Natural History. The following spe-

cies were in our collection: Succinea lumbalis Gld., Leptachatina striatula Gld., and Bifidaria pediculus var. nacca Gld.

Those not in our collection were: Nesopupa lyrata Gld., Kaliella subtilissima Gld:, and Opeas junceus Gld. The rest of Gould's types were seen in Washington.

On returning to New York a careful list of all the descriptions and of the papers relating to our land shells, and not in the library, was made.

Of the 202 papers, published up to 1906 and relating to our shells, 108 are in our library or have been sent to the writer by their authors. All, but one or two of the remaining 94, were read and, if important, copied or notes made of their contents. All descriptions were copied, so that we now have practically all the descriptions of the species of our land shells.

With Dr. Pilsbry a paper was prepared on the Helicina of our Islands. Another short paper was published in the Proceedings of the Academy of Natural Sciences of Philadelphia "On Hawaiian Species of Sphyradium."

During this second visit to Philadelphia, Dr. Pilsbry suggested that the writer work up, in connection with him, the genera Leptachatina and Auriculella and the Hawaiian species of Tornatellina. Permission was asked for and granted and all the specimens belonging to these genera in the Museum collection were sent on for study. The work on these genera occupied all the time from May until the latter part of September, and the manuscripts are nearly ready for publication.

In closing the writer wishes to thank the Director and the Trustees for permission to take the trip; also Mr. Thaanum and Mr. Lyman for series of shells to be taken along. The writer also wishes to thank the following gentlemen for their many kindnesses and for permitting him to examine the shells belonging to them or in their charge: Dr. William H. Dall, Dr. Bartsch, Prof. H. W. Henshaw, M. C. F. Ancey, Mr. Edgar Smith, Mr. E. R. Sykes, Dr. Samuel Henshaw, Dr. Faxon, Dr. Alfred G. Mayer, Dr. C. W. Johnson. Prof. H. S. Williams, Dr. J. M. Clarke, Mr. Vanatta, and especially Dr. H. A. Pilsbry for his help, suggestions and encouragement.

List of Accessions.

DEPARTMENT OF ETHNOLOGY.

Gifts.

6698 Armor, coir trousers. Gilbert Ids. Given by Mrs. Andrews.
6699 Kupee niho ilio. Hawaiian Ids. Id.
6700-02 Three pieces kapa. Hawaiian Ids. Id.
6703-04 Stone implements. Punaluu, Hawaii. Given by Mr. R. T. Forrest.
8200 Seventy-eight stone implements—arrows, spears and saws from the site of neolithic (?) villages north of the Fayûm, Egypt. Given by Mr. H. W. Seton-Karr.
9055 Pohaku hana ikaika. Kukaiau, Hawaii. Given by Mr. E. Madden.
9056 Kuula. Kawaihae, Hawaii. Given by Queen Emma Estate.
9059-60 Wooden idols (models). Philippine Ids. Given by Mr. A. F. Judd.
9061 Complete model of house. Philippine Ids. Given by Mr. A. F. Judd.
9063 Large house post. Waialua, Oahu. Given by Rev. W. D. Westervelt.

Collected.

6705 Rock picture. Punaluu, Hawaii.
6706-13 Rock pictures. Puna, Hawaii.
9053-54 Stone papamu. Puna, Hawaii.
9057 Stone dish. Kawaihae, Hawaii.
9061 Piece of cave wall. Kau, Hawaii.

Purchased.

6693 Wooden idol. Hawaiian Ids.
6694 Shrimp trap. Hawaiian Ids.
6695 Aumaka. Hawaiian Ids.
6696 Hula drum. Hawaiian Ids.

6697 White kapa. Hawaiian Ids.
9058 Wooden idol. Hawaii.
9062 Adze grindstone. Hawaii. By exchange.

Loan.

Collection illustrated and described in B. P. B. M. Memoirs, vol. ii, no. 2. Loaned by Messrs. Forbes, Haenish and Wagener, and returned.

ORNITHOLOGY AND MAMMALOGY.

4528 Platycercus eximius Shaw. Australia. Given by Mr. J. W. Thompson.
4529-30 Two hybrid geese. Hawaii. Given by Senator Hewitt.
4531 Cyanorhamphus unicolor Vig. New Zealand. Purchased.
4532 Hybrid albatross. Laysan Id. Given by Mr. P. E. H. Bomke.
4535-40 Six bird skins from Laysan Id. Given by Mr. P. E. H. Bomke.
9008 Boar's skull. Kauai. Given by Mr. August Knudsen.
9009 Hawaiian bat. Hawaii. Given by Mr. Julian Monsarrat.

CONCHOLOGY.

One hundred and fifteen lots of land shells, acquired by collecting and identifying specimens.

ADDITIONS TO THE LIBRARY.

Accessions denoted by an asterisk were acquired by exchange.

*Academy of Natural Sciences of Philadelphia.—Proceedings, vol. lvii, pt. 3; vol. lviii, pts. 1, 2.—Annual Report for 1905.

*Accademia Reale dei Lincei, Roma.—Memories, Serie Quinta, vol. v, fasc. 11, 12; vol. vi, fasc. 1-8. Atti, Serie Quinta, fasc. 1-12.

American Anthropologist.—Vol. vii, pts. 3, 4; vol. viii, pts. 1-3.

American Museum Journal.—Vol. vi, nos. 1-4

*American Museum of Natural History.—Vol. iv, pts. 1-3.—Bulletin, vol. xxi.—Annual Report for 1905.

*American Philosophical Society. — Transactions, vol. xxi, pts. 2, 3.—Proceedings, vol. xliv, no. 181; vol. xlv, nos. 182, 183.

Anatomy and Physiology, Journal of.—Vol. xl, pts. 2-4.

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Anthropologischer Gesellschaft. Berlin.
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Asiatic Society of Bengal. Calcutta, India.
Auckland Institute. Auckland, N. Z.
Australian Museum. Sydney.
Boston Public Library.
Boston Society of Natural History.
Brooklyn Institute of Fine Arts and Sciences, Museum of the.
California Academy of Sciences. San Francisco.
Canterbury Museum. Christchurch, N. Z.

Carnegie Institution. Washington, D. C.
Carnegie Museum. Pittsburg, Penn.
Columbia University Library. New York.
Connecticut Academy of Arts and Sciences. New Haven.
Dartmouth College. Hanover, New Hampshire.
École d'Anthropologie de Paris.
Field Museum. Chicago.
Free Museum of Science and Art. Philadelphia.
Geological Survey of New South Wales. Sydney.
Gordon Technical College. Geelong, Australia.
Harvard University Library. Cambridge, Mass.
Hawaiian Evangelical Association. Honolulu.
Hawaiian Historical Society. Honolulu.
Hilo Public Library. Hawaii.
Honolulu Library Association. Honolulu.
Indian Museum. Calcutta, India.
Jardin Botanique de Buitenzorg. Java.
Johns Hopkins University. Baltimore.
K. K. Naturhistorische Hofmuseum. Wien.
Kongl. Vitterhets Historie och Antiqvitets Akademien. Stockholm.
Königliche Ethnographische Museum. München.
Königliche Museum für Völkerkunde. Berlin.
Königliche Zoologische und Anthropologisch-Ethnographische Museum. Dresden.
Leland Stanford Junior University. California.
Library of Congress. Washington.
Linnean Society of London.
Linnean Society of New South Wales. Sydney.
Madras Government Museum. Madras, India.
Marine Biological Association of the United Kingdom. Plymouth.
Maryland Geological Survey. Baltimore.
Mexico Instituto Geologico.
Missouri Botanical Garden. St. Louis.
Museo Civico di Storia Naturale di Genoa.
Museo Nacional de Buenos Aires.
Museu Goeldi. Para, Brazil.
Museu Paulista. Sâo Paulo, Brazil.
Museum of Comparative Zoology. Cambridge, Mass.
Museum of Fine Arts. Boston.
Museum für Natur-, Völker- und Handelskunde. Bremen.
Museum National Hongrois. Pudapest.
New South Wales Department of Fisheries.
New Zealand Institute. Wellington.
Oahu College. Honolulu.
Peabody Academy of Science. Salem, Mass.
Peabody Museum. Cambridge, Mass.

Philadelphia Commercial Museums.
Philippine Islands, Bureau of Government Laboratories.
Philippine Islands, Ethnological Survey.
Polynesian Society. Wellington, N. Z.
Public Museum. Wanganui, N. Z.
Real Academia de Ciencias y Artes de Barcelona.
Rijks Ethnographische Museum. Leiden.
's Rijks Museum van Naturvlijke Historie. Leiden.
Royal Geographical Society. London.
Royal Irish Academy, Dublin.
Royal Society of Edinburgh.
Royal Society of New South Wales. Sydney.
Royal Society of Queensland. Brisbane.
Royal Society of South Australia. Adelaide.
Royal Society of Victoria. Melbourne.
Smithsonian Institution. Washington.
" " Bureau of American Ethnology. Washington.
" " U. S. National Museum. Washington.
Società Italiana di Antropologia e Etnologia. Firenze.
Société d'Anthropologie. Paris.
Société Royale des Antiquaires du Nord. Copenhague.
Société Royale Malacologique de Belgique. Bruxelles.
South African Museum. Capetown.
South Australian Museum. Adelaide.
Stadischen Museum für Völkerkunde zu Leipzig.
Tufts College. Mass.
Universiteit van Amsterdam.
University of California. Berkeley, Cal.
University of Kansas. Lawrence, Kansas.
University of Pennsylvania. Philadelphia.
U. S. Experiment Station. Honolulu.
U. S. Geological Survey. Washington, D. C.
Wagner Free Institute of Science. Philadelphia.
Yale University Library. New Haven.

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New species are marked with an asterisk.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—NO. 1.

Director's Report for 1902.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1903.

TO THE PRESIDENT AND TRUSTEES OF THE BERNICE PAUAHI BISHOP MUSEUM.

SIRS:—In accordance with the vote of the Trustees at the stated meeting held January 13, 1900, I present for your consideration my report of the condition of the Museum in my charge, and of the work done by myself and staff, during the calendar year 1902.

WILLIAM T. BRIGHAM,
Director of the Museum.

Honolulu, March 16, 1903.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF
POLYNESIAN ETHNOLOGY AND
NATURAL HISTORY.

VOL. II.—NO. 2.

Director's Report for 1903.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1904.

TO THE PRESIDENT AND TRUSTEES OF THE BERNICE PAUAHI BISHOP MUSEUM.

SIRS:—I herewith present for your consideration my report of the growth and present condition of the Museum in my charge, and of the work done by the Museum staff, during the calendar year 1903.

WILLIAM T. BRIGHAM,
Director of the Museum.

Honolulu, March 11, 1904.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—No. 3.

Director's Report for 1904.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1905.

TO THE PRESIDENT AND TRUSTEES OF THE BERNICE PAUAHI BISHOP MUSEUM.

SIRS:—In accordance with the vote of the Trustees at the stated meeting held January 13, 1900, I herewith present my report of the condition of the Museum in my charge, and of the work done by myself and staff during the calendar year 1904.

WILLIAM T. BRIGHAM,

Director of the Museum.

Honolulu, March 17, 1905.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—NO. 4.

Director's Report for 1905.

HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1906.

TO THE PRESIDENT AND TRUSTEES OF THE BERNICE PAUAHI BISHOP MUSEUM.

SIRS:—In accordance with the vote of the Trustees at the stated meeting held January 13, 1900, I herewith present my report of the condition of the Museum in my charge, and of the work done by myself and staff during the calendar year 1905.

WILLIAM T. BRIGHAM,

Director of the Museum.

Honolulu, March 9, 1906.

OCCASIONAL PAPERS

OF THE

BERNICE PAUAHI BISHOP MUSEUM OF POLYNESIAN ETHNOLOGY AND NATURAL HISTORY.

VOL. II.—NO. 5.

Director's Report for 1906.

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HONOLULU, H. I.
BISHOP MUSEUM PRESS.
1907.

TO THE TRUSTEES OF THE BERNICE PAUAHI BISHOP MUSEUM.

Sirs:—In accordance with the vote of the Trustees at the stated meeting of January 11, 1900, I submit my Annual Report on the present condition of the Museum and the work in its various departments during the year 1906.

WILLIAM T. BRIGHAM,
Director of the Museum.

Honolulu, January 11, 1907.
Ordered printed May 3, 1907.

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